Annual Water Data Report

Documentation

Downstream order and station number

Since October 1, 1950, hydrologic-station records in USGS reports have been listed in order of downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary entering between two mainstream stations is listed between those stations. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is located with respect to the stream to which it is immediately tributary is indicated by an indention in that list of stations in the front of this report. Each indentation represents one rank. This downstream order and system of indentation indicates which stations are on tributaries between any two stations and the rank of the tributary on which each station is located.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These station numbers are in the same downstream order used in this report. In assigning a station number, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list composed of both types of stations. Gaps are consecutive. The complete 8-digit (or 10-digit) number for each station such as 09004100, which appears just to the left of the station name, includes a 2-digit part number "09" plus the 6-digit (or 8-digit) downstream order number "004100." In areas of high station density, an additional two digits may be added to the station identification number to yield a 10-digit number. The stations are numbered in downstream order as described above between stations of consecutive 8- digit numbers.

Numbering system for wells and miscellaneous sites

The USGS well and miscellaneous site-numbering system is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, and the next 7 digits denote degrees, minutes, and seconds of longitude; the last 2 digits are a sequential number for wells within a 1-second grid. In the event that the latitude-longitude coordinates for a well and miscellaneous site are the same, a sequential number such as "01," "02," and so forth, would be assigned as one would for wells (see fig. 1). The 8-digit, downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

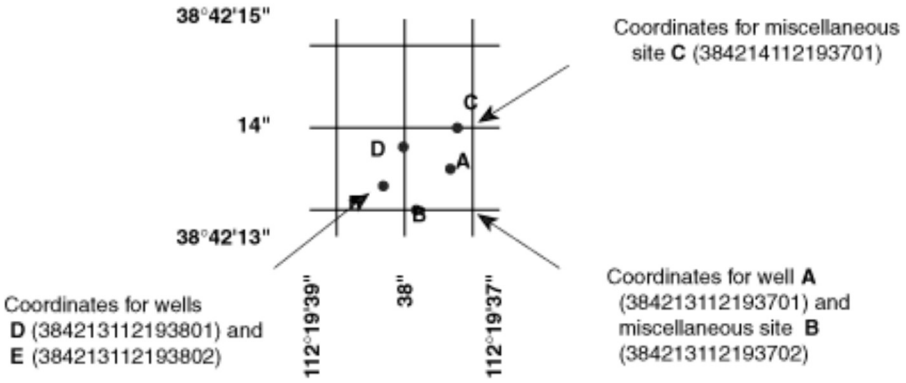


Figure 1. Example of system for numbering wells and miscellaneous sites (latitude and longitude).

In addition to the well number that is based on the latitude and longitude for each well, another well number may be provided which in many States is based on the Public Land Survey System, a set of rectangular surveys that is used to identify land parcels. This well number is familiar to the water users in, for example, Utah and shows the location of the well by quadrant, township, range section, and position within the section (see fig. 2).

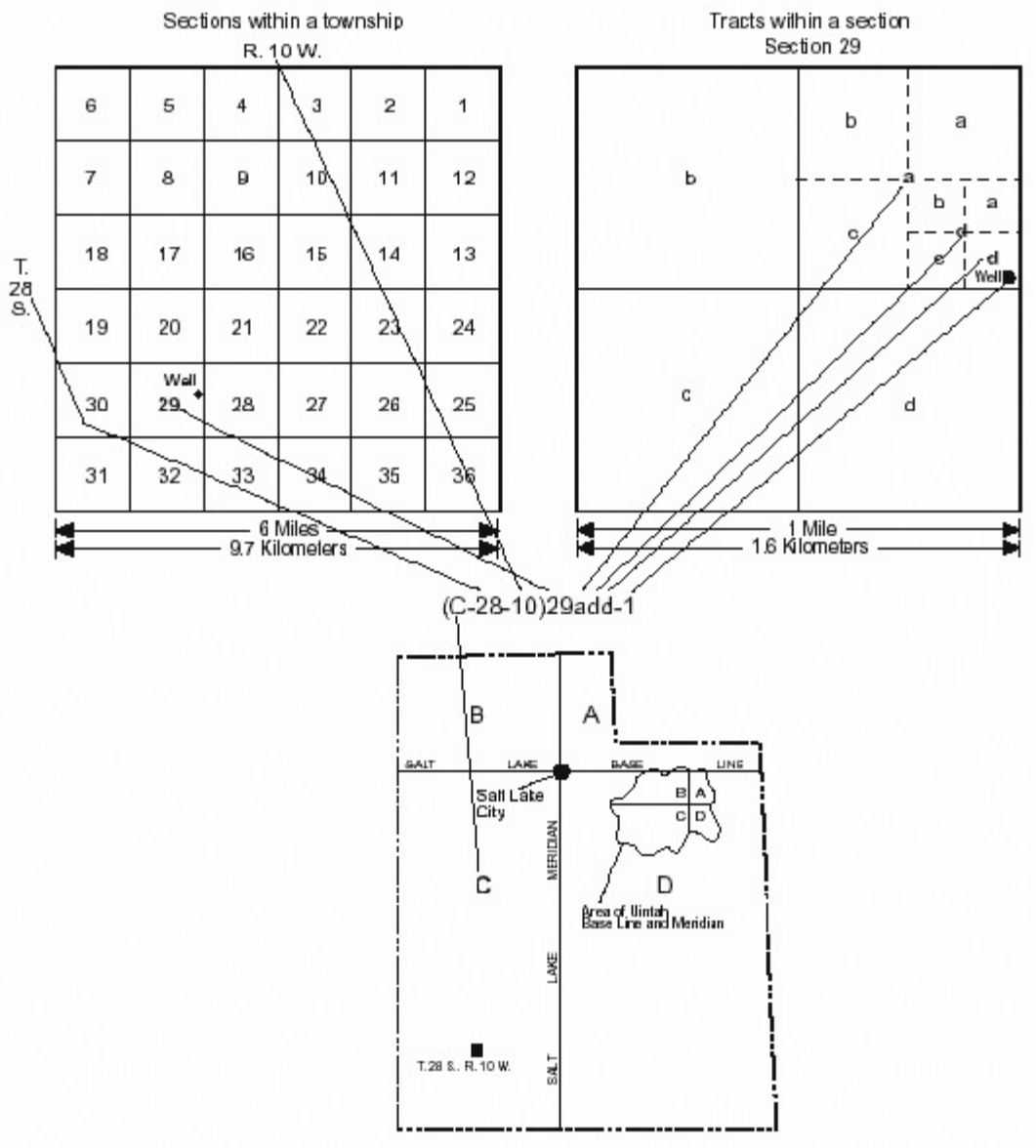


Figure 2. Example of system for numbering wells and miscellaneous sites (township and range).

Some Water Science Centers also identify each ground-water site by a local number that consists of an abbreviation of the county name as well as the township, range and section, and a four-digit number assigned to the well. Naming conventions specific to an individual Water Science Center can be obtained locally from each USGS Water Science Center.

Explanation of stage- and water-discharge records

Data Collection and Computation

The base data collected at gaging stations consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and volume of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from a water-stage recorder that is either downloaded electronically in the field to a laptop computer or similar device or is transmitted using telemetry such as GOES satellite, land-line or cellular-phone modems, or by radio transmission. Measurements of discharge are made with a current meter or acoustic Doppler current profiler, using the general methods adopted by the USGS. These methods are described in standard textbooks, USGS Water- Supply Paper 2175, and the Techniques of Water-Resources Investigations of the United States Geological Survey (TWRIs), Book 3, Chapters A1

through A19 and Book 8, Chapters A2 and B2, which may be accessed from http://water.usgs.gov/pubs/twri/. The methods are consistent with the American Society for Testing and Materials (ASTM) standards and generally follow the standards of the International Organization for Standardization (ISO).

For stream-gaging stations, discharge-rating tables for any stage are prepared from stage-discharge curves. If extensions to the rating curves are necessary to express discharge greater than measured, the extensions are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, or computation of flow over dams and weirs), step-backwater techniques, velocity-area studies, and logarithmic plotting. The daily mean discharge is computed from gage heights and rating tables, then the monthly and yearly mean discharges are computed from the daily values. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features of the stream channel, the daily mean discharge is computed by the shifting-control method in which correction factors that are based on individual discharge measurements and notes by engineers and observers are used when applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the controlling section, the daily mean discharge is computed by the shifting-control method.

The stage-discharge relation at some stream-gaging stations is affected by backwater from reservoirs, tributary streams, or other sources. Such an occurrence necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage at some distance from the base gage. An index velocity is measured using ultrasonic or acoustic instruments at some stream-gaging stations, and this index velocity is used to calculate an average velocity for the flow in the stream. This average velocity along with a stage-area relation is then used to calculate average discharge. At some stations, the stage-discharge relation is affected by changing stage. At these stations, the rate of change in stage is used as a factor in computing discharge.

At some stream-gaging stations in the northern United States, the stage-discharge relation is affected by ice in the winter; therefore, computation of the discharge in the usual manner is impossible. Discharge for periods of ice effect is computed on the basis of gage-height record and occasional winter-discharge measurements. Consideration is given to the available information on temperature and precipitation, notes by gage observers and hydrologists, and comparable records of discharge from other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the volume or contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly changes are computed.

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys, the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some stream-gaging stations, periods of time occur when no gage-height record is obtained or the recorded gage height is faulty and cannot be used to compute daily discharge or contents. Such a situation can happen when the recorder stops or otherwise fails to operate properly, the intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated on the basis of recorded range in stage, prior and subsequent records, discharge measurements, weather records, and comparison with records from other stations in the same or nearby basins. Likewise, lake or reservoir volumes may be estimated on the basis of operator's log, prior and subsequent records, inflow-outflow studies, and other information.

Data Presentation

The records published for each continuous record surface-water discharge station (stream-gaging station) consist of five parts: (1) the station manuscript or description; (2) the data table of daily mean values of discharge for the current water year with summary data; (3) a tabular statistical summary of monthly mean flow data for a designated period, by water year; (4) a summary statistics table that includes

statistical data of annual, daily, and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration; and (5) a hydrograph of discharge.

Station Manuscript

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; record accuracy; and other remarks pertinent to station operation and regulation. The following information, as appropriate, is provided with each continuous record of discharge or lake content. Comments follow that clarify information presented under the various headings of the station description.

LOCATION.-Location information is obtained from the most accurate maps available. The location of the gaging station with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.-Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.-This term indicates the time period for which records have been published for the station or for an equivalent station. An equivalent station is one that was in operation at a time that the present station was not and whose location was such that its flow reasonably can be considered equivalent to flow at the present station.

REVISED RECORDS.-If a critical error in a published site data sheet is discovered, a revision is included (where?) in the next publishing cycle following discovery of the error.

GAGE.-The type of gage in current use, the datum of the current gage referred to a standard datum, and a condensed history of the types, locations, and datums of previous gages are given under this heading.

REMARKS.-All periods of estimated daily discharge either will be identified by date in this paragraph of the station description for water discharge stations or flagged in the daily discharge table. (See section titled Identifying Estimated Daily Discharge.) Information is presented relative to the accuracy of the records, to special methods of computation, and to conditions that affect natural flow at the station. In addition, information may be presented pertaining to average discharge data for the period of record; to extremes data for the period of record and the current year; and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, the outlet works and spillway, and the purpose and use of the reservoir.

COOPERATION.-Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here.

EXTREMES OUTSIDE PERIOD OF RECORD.-Information here documents major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the USGS.

REVISIONS.-Records are revised if errors in published records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based national data system, NWISWeb (http://water.usgs.gov/nwis/nwis). Users are encouraged to obtain all required data from NWIS or NWISWeb to ensure that they have the most recent data updates. Updates to NWISWeb are made on an annual basis.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because no current or, possibly, future station manuscript would be published for these stations to document the revision in a REVISED RECORDS entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the USGS Water Science Center in the state where the station is located to determine if the published records were revised after the station was discontinued.

If, however, the data for a discontinued station were obtained by computer retrieval, the data would be current. Any published revision of data is always accompanied by revision of the corresponding data in computer storage.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the REMARKS and in the inclusion of a stage-capacity table when daily volumes are given.

Peak Discharge Greater than Base Discharge

Tables of peak discharge above base discharge are included for some stations where secondary instantaneous peak discharge data are used in flood-frequency studies of highway and bridge design, flood-control structures, and other flood related projects. The base discharge value is selected so an average of three peaks a year will be reported. This base discharge value has a recurrence interval of approximately 1.1 years or a 91-percent chance of exceedence in any 1 year.

Data Table of Daily Mean Values

The daily table of discharge records for streamgaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed TOTAL gives the sum of the daily figures for each month; the line headed MEAN gives the arithmetic average flow in cubic feet per second for the month; and the lines headed MAX and MIN give the maximum and minimum daily mean discharges, respectively, for each month. Discharge for the month is expressed in cubic feet per second per square mile (line headed CFSM); or in inches (line headed IN); or in acrefeet (line headed AC-FT). Values for cubic feet per second per square mile and runoff in inches or in acre-feet may be omitted if extensive regulation or diversion is in effect or if the drainage area includes large noncontributing areas. At some stations, monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir volumes are given. These values are identified by a symbol and a corresponding footnote.

Statistics of Monthly Mean Data

A tabular summary of the mean (line headed MEAN), maximum (MAX), and minimum (MIN) of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the first occurrence of the maximum and minimum monthly flows are provided immediately below those values. The designated period will be expressed as FOR WATER YEARS __-__, BY WATER YEAR (WY), and will list the first and last water years of the range of years selected from the PERIOD OF RECORD paragraph in the station manuscript. The designated period will consist of all of the station record within the specified water years, including complete months of record for partial water years, and may coincide with the period of record for the station. The water years for which the statistics are computed are consecutive, unless a break in the station record is indicated in the manuscript.

Summary Statistics

A table titled SUMMARY STATISTICS follows the statistics of monthly mean data tabulation. This table consists of four columns with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily, and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, WATER YEARS __-__, will consist of all of the station records within the specified water years, including complete months of record for partial water years, and may coincide with the period of record for the station. The water years for which the statistics are computed are consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (see line headings below), except for the ANNUAL 7-DAY MINIMUM statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years. The date or water year, as appropriate, of the first occurrence of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted in the REMARKS paragraph of the manuscript or in footnotes. Because the designated period may not be the same as the station period of record published in the

manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designated-period column may not be within the selected water years listed in the heading. When the dates of occurrence do not fall within the selected water years listed in the heading, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration-curve statistics and runoff data also are given. Runoff data may be omitted if extensive regulation or diversion of flow is in effect in the drainage basin.

The following summary statistics data are provided with each continuous record of discharge. Comments that follow clarify information presented under the various line headings of the SUMMARY STATISTICS table.

ANNUAL TOTAL.-The sum of the daily mean values of discharge for the year.

ANNUAL MEAN.-The arithmetic mean for the individual daily mean discharges for the year noted or for the designated period.

HIGHEST ANNUAL MEAN.-The maximum annual mean discharge occurring for the designated period.

LOWEST ANNUAL MEAN.-The minimum annual mean discharge occurring for the designated period.

HIGHEST DAILY MEAN.-The maximum daily mean discharge for the year or for the designated period.

LOWEST DAILY MEAN.-The minimum daily mean discharge for the year or for the designated period.

ANNUAL 7-DAY MINIMUM.-The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. This value should not be confused with the 7-day 10-year low-flow statistic.

MAXIMUM PEAK FLOW.-The maximum instantaneous peak discharge occurring for the water year or designated period. Occasionally the maximum flow for a year may occur at midnight at the beginning or end of the year, on a recession from or rise toward a higher peak in the adjoining year. In this case, the maximum peak flow is given in the table and the maximum flow may be reported in a footnote or in the REMARKS paragraph in the manuscript.

MAXIMUM PEAK STAGE.-The maximum instantaneous peak stage occurring for the water year or designated period. Occasionally the maximum stage for a year may occur at midnight at the beginning or end of the year, on a recession from or rise toward a higher peak in the adjoining year. In this case, the maximum peak stage is given in the table and the maximum stage may be reported in the REMARKS paragraph in the manuscript or in a footnote. If the dates of occurrence of the maximum peak stage and maximum peak flow are different, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

INSTANTANEOUS LOW FLOW.-The minimum instantaneous discharge occurring for the water year or for the designated period.

ANNUAL RUNOFF.-Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data:

Acre-foot (AC-FT) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Cubic feet per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming the runoff is distributed uniformly in time and area.

Inches (INCHES) indicate the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

10 PERCENT EXCEEDS.-The discharge that has been exceeded 10 percent of the time for the designated period.

50 PERCENT EXCEEDS.-The discharge that has been exceeded 50 percent of the time for the designated period.

90 PERCENT EXCEEDS.-The discharge that has been exceeded 90 percent of the time for the designated period.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first table lists annual maximum stage and discharge at crest-stage stations, and the second table lists discharge measurements at lowflow partial-record stations. The tables of partialrecord stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are often made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for a special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified. This identification is shown either by flagging individual daily values with the letter "e" and noting in a table footnote, "e- Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

Accuracy of Field Data and Computed Results

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretations of records.

The degree of accuracy of the records is stated in the REMARKS in the station description. "Excellent" indicates that about 95 percent of the daily discharges are within 5 percent of the true value; "good" within 10 percent; and "fair," within 15 percent. "Poor" indicates that daily discharges have less than "fair" accuracy. Different accuracies may be attributed to different parts of a given record.

Values of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 ft^3/s; to the nearest tenths between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1,000 ft^3/s; and to three significant figures above 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharge values listed for partial-record stations.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, values of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Data Records Available

Information of a more detailed nature than that published for most of the stream-gaging stations such as discharge measurements, gage-height records, and rating tables is available from the USGS Water Science Center. Also, most streamgaging station records are available in computer usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the USGS Water Science Center in the state where the station is located.

Explanation of precipitation records

Data Collection and Computation

Rainfall data generally are collected using electronic data loggers that measure the rainfall in 0.01-inch increments every 15 minutes using either a tipping-bucket rain gage or a collection well gage. Twenty-four hour rainfall totals are tabulated and presented. A 24-hour period extends from just past midnight of the previous day to midnight of the current day. Snowfall-affected data can result during cold weather when snow fills the rain-gage funnel and then melts as temperatures rise. Snowfall-affected data are subject to errors. Missing values are indicated by this symbol "---" in the table.

Data Presentation

Precipitation records collected at surface-water gaging stations are identified with the same station number and name as the stream-gaging station. Where a surface-water daily-record station is not available, the precipitation record is published with its own name and latitude-longitude identification number.

Information pertinent to the history of a precipitation station is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, period of record, and general remarks. The following information is provided with each precipitation station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.-See Data Presentation in the EXPLANATION OF STAGE- AND WATERDISCHARGE RECORDS section of this report (same comments apply).

PERIOD OF RECORD.-See Data Presentation in the EXPLANATION OF STAGE- AND WATERDISCHARGE RECORDS section of this report (same comments apply).

INSTRUMENTATION.-Information on the type of rainfall collection system is given.

REMARKS.-Remarks provide added information pertinent to the collection, analysis, or computation of records.

Explanation of water-quality records

Collection and Examination of Data Surface-water samples for analysis usually are collected at or near stream-gaging stations. The quality-of-water records are given immediately following the discharge records at these stations. The descriptive heading for water-quality records gives the period of record for all water-quality data; the period of daily record for parameters that are measured on a daily basis (specific conductance, water temperature, sediment discharge, and so forth); extremes for the current year; and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, sampling date, or other pertinent data are given in the table containing the chemical analyses of the ground water.

Water Analysis

Most of the methods used for collecting and analyzing water samples are described in the TWRIs, which may be accessed from http:// water.usgs.gov/pubs/twri/.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary considerably with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled at several verticals to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum and minimum values (and sometimes mean or median values) for each constituent measured and are based on 15-minute or 1-hour intervals of recorded data beginning at 0000 hours and ending at 2400 hours for the day of record.

Parameter Codes

See link.

Medium Codes

See link.

Surface-water-quality records

Records of surface-water quality ordinarily are obtained at or near stream-gaging stations because discharge data are useful in the interpretation of surface-water quality. Records of surface-water quality in this report involve a variety of types of data and measurement frequencies.

Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuous-record station is a site where data are collected on a regularly scheduled basis. Frequency may be one or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuous- or partial-record station, where samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between continuous records as used in this report and continuous recordings that refer to a continuous graph or a series of discrete values recorded at short intervals. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report may be published as a USGS Annual Scientific Investigations Report by State, and may be accessed from http://pubs.usgs.gov, or the Related Information and Publications page of this Web Site.

Accuracy of the Records

One of four accuracy classifications is applied for measured physical properties at continuous-record stations on a scale ranging from poor to excellent. The accuracy rating is based on data values recorded before any shifts or corrections are made. Additional consideration also is given to the amount of publishable record and to the amount of data that have been corrected or shifted.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs

significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

Onsite Measurements and Sample Collection

In obtaining water-quality data, a major concern is assuring that the data obtained represent the naturally occurring quality of the water. To ensure this, certain measurements, such as water temperature, pH, and dissolved oxygen, must be made onsite when the samples are collected. To assure that measurements made in the laboratory also represent the naturally occurring water, carefully prescribed procedures must be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D2; Book 3, Chapters A1, A3, and A4; and Book 9, Chapters A1-A9. Most of the methods used for collecting and analyzing water samples are described in the TWRIs, which may be accessed from http://water.usgs.gov/pubs/twri/. Also, detailed information on collecting, treating, and shipping samples can be obtained from the USGS Water Science Center.

Rating the accuracy of continuous water-quality records
[≤, less than or equal to; ±, plus or minus value shown; °C, degree Celsius; >, greater than; %, percent; mg/L, milligram per liter; pH unit, standard pH unit]

Measured field parameter	**Ratings of accuracy (Based on combined fouling and calibration drift corrections applied to the record)**			
	Excellent	**Good**	**Fair**	**Poor**
Water temperature	≤ ± 0.2 °C	> ± 0.2 - 0.5 °C	> ± 0.5 - 0.8 °C	> ± 0.8 °C
Specific conductance	≤ ± 3%	> ± 3 - 10%	> ± 10 - 15%	> ± 15%
Dissolved oxygen	≤ ± 0.3 mg/L or ≤ ± 5%, whichever is greater	> ± 0.3 - 0.5 mg/L or > ± 5 - 10%, whichever is greater	> ± 0.5 - 0.8 mg/L or > ± 10 - 15%, whichever is greater	> ± 0.8 mg/L or > ± 15%, whichever is greater
pH	≤ ± 0.2 units	> ± 0.2 - 0.5 units	> ± 0.5 - 0.8 units	> ± 0.8 units
Turbidity	≤ ± 0.5 turbidity units or ≤ ± 5%, whichever is greater	> ± 0.5 - 1.0 turbidity units or > ± 5 - 10%, whichever is greater	> ± 1.0 - 1.5 turbidity units or > ± 10 - 15%, whichever is greater	> ± 1.5 turbidity units or > ± 15%, whichever is greater

Water Temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at the time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same

time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water discharge-measurements are on file in the USGS Water Science Center in the State where the station is located.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross section.

During periods of rapidly changing flow or rapidly changing concentration, samples may be collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration are computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily discharges of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples are collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observation, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended-sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

Laboratory Measurements

Samples for biochemical oxygen demand (BOD) and indicator bacteria are analyzed locally. All other samples are analyzed in the USGS laboratory in Lakewood, Colorado, unless otherwise noted. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chapter C1. Methods used by the USGS laboratories are given in the TWRIs, Book 1, Chapter D2; Book 3, Chapter C2; and Book 5, Chapters A1, A3, and A4. The TWRI publications may be accessed from http://water.usgs.gov/pubs/twri/. These methods are consistent with ASTM standards and generally follow ISO standards.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved oxygen, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.-See Data Presentation information in the EXPLANATION OF STAGE- AND WATER-DISCHARGE

RECORDS section of this report (same comments apply).

DRAINAGE AREA.-See Data Presentation information in the EXPLANATION OF STAGEAND WATER-DISCHARGE RECORDS section of this report (same comments apply).

PERIOD OF RECORD.-This indicates the time periods for which published water-quality records for the station are available. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.-Information on instrumentation is given only if a water-quality monitor temperature record, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.-Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.-Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here. EXTREMES.-Maximums and minimums are given only for parameters measured daily or more frequently. For parameters measured weekly or less frequently, true maximums or minimums may not have been obtained. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.-Records are revised if errors in published water-quality records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based national data system, NWISWeb (http://waterdata.usgs.gov/nwis). Users of USGS water-quality data are encouraged to obtain all required data from NWIS or NWISWeb to ensure that they have the most recent updates. Updates to the NWISWeb are made on an annual basis.

The surface-water-quality records for partialrecord stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this section:

Printed Output	Remark
E	Value is estimated.
>	Actual value is known to be greater than the value shown.
<	Actual value is known to be less than the value shown.
M	Presence of material verified, but not quantified.
N	Presumptive evidence of presence of material.
U	Material specifically analyzed for, but not detected.
A	Value is an average.
V	Analyte was detected in both the environmental sample and the associated blanks.
S	Most probable value.

Water-Quality Control Data

The USGS National Water Quality Laboratory collects quality-control data on a continuing basis to evaluate selected analytical methods to determine long-term method detection levels (LTMDLs) and laboratory reporting levels (LRLs). These values are re-evaluated each year on the basis of the most recent quality-control data and, consequently, may change from year to year.

This reporting procedure limits the occurrence of false positive error. Falsely reporting a concentration greater than the LT-MDL for a sample in which the analyte is not present is 1 percent or less. Application of the LRL limits the occurrence of false negative error. The chance of falsely reporting a nondetection for

a sample in which the analyte is present at a concentration equal to or greater than the LRL is 1 percent or less.

Accordingly, concentrations are reported as less than LRL for samples in which the analyte either was not detected or did not pass identification. Analytes detected at concentrations between the LT-MDL and the LRL and that pass identification criteria are estimated. Estimated concentrations will be noted with a remark code of "E." These data should be used with the understanding that their uncertainty is greater than that of data reported without the E remark code.

Data generated from quality-control (QC) samples are a requisite for evaluating the quality of the sampling and processing techniques as well as data from the actual samples themselves. Without QC data, environmental sample data cannot be adequately interpreted because the errors associated with the sample data are unknown. The various types of QC samples collected by a USGS Water Science Center are described in the following section. Procedures have been established for the storage of water-quality-control data within the USGS. These procedures allow for storage of all derived QC data and are identified so that they can be related to corresponding environmental samples. These data are not presented in this report but are available from the USGS Water Science Center in the State where the Station is located.

Blank Samples

Blank samples are collected and analyzed to ensure that environmental samples have not been contaminated in the overall data-collection process. The blank solution used to develop specific types of blank samples is a solution that is free of the analytes of interest. Any measured value signal in a blank sample for an analyte (a specific component measured in a chemical analysis) that was absent in the blank solution is believed to be due to contamination. Many types of blank samples are possible; each is designed to segregate a different part of the overall data-collection process. The types of blank samples potentially collected by USGS Water Science Centers are:

Field blank-A blank solution that is subjected to all aspects of sample collection, field processing preservation, transportation, and laboratory handling as an environmental sample.

Trip blank-A blank solution that is put in the same type of bottle used for an environmental sample and kept with the set of sample bottles before and after sample collection.

Equipment blank-A blank solution that is processed through all equipment used for collecting and processing an environmental sample (similar to a field blank but normally done in the more controlled conditions of the office).

Sampler blank-A blank solution that is poured or pumped through the same field sampler used for collecting an environmental sample.

Filter blank-A blank solution that is filtered in the same manner and through the same filter apparatus used for an environmental sample.

Splitter blank-A blank solution that is mixed and separated using a field splitter in the same manner and through the same apparatus used for an environmental sample.

Preservation blank-A blank solution that is treated with the sampler preservatives used for an environmental sample.

Reference Samples

Reference material is a solution or material prepared by a laboratory. The reference material composition is certified for one or more properties so that it can be used to assess a measurement method. Samples of reference material are submitted for analysis to ensure that an analytical method is accurate for the known properties of the reference material. Generally, the selected reference material properties are similar to the environmental sample properties.

Replicate Samples

Replicate samples are a set of environmental samples collected in a manner such that the samples are thought to be essentially identical in composition. Replicate is the general case for which a duplicate is the special case consisting of two samples. Replicate samples are collected and analyzed to establish the amount of variability in the data contributed by some part of the collection and analytical process. Many types of replicate samples are possible, each of which may yield slightly different results in a dynamic hydrologic setting, such as a flowing stream. The types of replicate samples collected in this district are:

Concurrent samples-A type of replicate sample in which the samples are collected simultaneously with two or more samplers or by using one sampler and alternating the collection of samples into two or more compositing containers.

Sequential samples-A type of replicate sample in which the samples are collected one after the other, typically over a short time.

Split sample-A type of replicate sample in which a sample is split into subsamples, each subsample contemporaneous in time and space.

Spike Samples

Spike samples are samples to which known quantities of a solution with one or more well-established analyte concentrations have been added. These samples are analyzed to determine the extent of matrix interference or degradation on the analyte concentration during sample processing and analysis.

Explanation of ground-water level records

Generally, only ground-water-level data from selected wells with continuous recorders from a basic network of observation wells are published in this report. This basic network contains observation wells located so that the most significant data are obtained from the fewest wells in the most important aquifers.

Site Identification Numbers

Each well is identified by means of (1) a 15- digit number that is based on latitude and longitude and (2) a local number that is produced for local needs. See NUMBERING SYSTEM FOR WELLS AND MISCELLANEOUS SITES in this report for a detailed explanation.

Data Collection and Computation

Measurements are made in many types of wells, under varying conditions of access and at different temperatures; hence, neither the method of measurement nor the equipment can be standardized. At each observation well, however, the equipment and techniques used are those that will ensure that measurements at each well are consistent.

Most methods for collecting and analyzing water samples are described in the TWRIs referred to in the Onsite Measurements and Sample Collection and the Laboratory Measurements sections in this report. In addition, TWRI Book 1, Chapter D2, describes guidelines for the collection and field analysis of ground-water samples for selected unstable constituents. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D2; Book 3, Chapters A1, A3, and A4; and Book 9, Chapters A1 through A9. The TWRI publications may be accessed from http://water.usgs.gov/pubs/twri/. The values in this report represent water-quality conditions at the time of sampling, as much as possible, and that are consistent with available sampling techniques and methods of analysis. These methods are consistent with ASTM standards and generally follow ISO standards. Trained personnel collected all samples. The wells sampled were pumped long enough to ensure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the

elevation of the land-surface datum above sea level is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (EOM).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth of water of several hundred feet, the error in determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given only to a tenth of a foot or a larger unit.

Data Presentation

Water-level data are presented in alphabetical order by county. The primary identification number for a given well is the 15-digit site identification number that appears in the upper left corner of the table. The secondary identification number is the local or county well number. Well locations are shown and each well is identified by its local well or county well number on a map in the local Water Science Center's Annual Scientific Investigation Report by State, and may be accessed from. . .

Each well record consists of three parts: the well description, the data table of water levels observed during the water year, and, for most wells, a hydrograph following the data table. Well descriptions are presented in the headings preceding the tabular data. The following comments clarify information presented in these various headings.

LOCATION.-This paragraph follows the well-identification number and reports the hydrologic-unit number and a geographic point of reference. Latitudes and longitudes used in this report are reported as North American Datum of 1927 unless otherwise specified.

AQUIFER-.This entry designates by name and geologic age the aquifer that the well taps.

WELL CHARACTERISTICS-.This entry describes the well in terms of depth, casing diameter and depth or screened interval, method of construction, use, and changes since construction.

INSTRUMENTATION-.This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on continuous, monthly, or some other frequency of measurement.

DATUM-.This entry describes both the measuring point and the land-surface elevation at the well. The altitude of the land-surface datum is described in feet above the altitude datum; it is reported with a precision depending on the method of determination. The measuring point is described physically (such as top of casing, top of instrument shelf, and so forth), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above National Geodetic Vertical Datum of 1929 (NGVD 29); it is reported with a precision depending on the method of determination.

REMARKS-.This entry describes factors that may affect the water level in a well or the measurement of the water level, when various methods of measurement were begun, and the network (climatic, terra ne, local, or areal effects) or the special project to which the well belongs.

PERIOD OF RECORD.-This entry indicates the time period for which records are published for the well, the month and year at the start of publication of water-level records by the USGS, and the words "to current year" if the records are to be continued into the following year. Time periods for which water-level records are available, but are not published by the USGS, may be noted.

EXTREMES FOR PERIOD OF RECORD.-This entry contains the highest and lowest instantaneously recorded or measured water levels of the period of published record, with respect to land-surface datum or sea level, and the dates of occurrence.

Water-Level Tables

A table of water levels follows the well description for each well. Water-level measurements in this report are given in feet with reference to either sea level or land-surface datum (lsd). Missing records are indicated by dashes in place of the water-level value.

For wells not equipped with recorders, water-level measurements were obtained periodically by steel or electric tape. Tables of periodic water-level measurements in these wells show the date of measurement and the measured water-level value.

Hydrographs

Hydrographs are a graphic display of water-level fluctuations over a period of time. In this report, current water year and, when appropriate, period-of-record hydrographs are shown.

Hydrographs that display periodic water-level measurements show points that may be connected with a dashed line from one measurement to the next. Hydrographs that display recorder data show a solid line representing the mean water level recorded for each day. Missing data are indicated by a blank space or break in a hydrograph. Missing data may occur as a result of recorder malfunctions, battery failures, or mechanical problems related to the response of the recorder's float mechanism to water-level fluctuations in a well.

Ground-water-quality data

Data Collection and Computation

The ground-water-quality data in this report were obtained as a part of special studies in specific areas. Consequently, a number of chemical analyses are presented for some wells within a county but not for others. As a result, the records for this year, by themselves, do not provide a balanced view of ground-water quality statewide. Most methods for collecting and analyzing water samples are described in the TWRIs, which may be accessed from http://water.usgs.gov/pubs/twri/. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRI, Book 1, Chapter D2; Book 5, Chapters A1, A3, and A4; and Book 9, Chapters A1-A6. Also, detailed information on collecting, treating, and shipping samples may be obtained from the local USGS Water Science Center.

Laboratory Measurements

Analysis for sulfide and measurement of alkalinity, pH, water temperature, specific conductance, and dissolved oxygen are performed onsite. All other sample analyses are performed at the USGS laboratory in Lakewood, Colorado, unless otherwise noted. Methods used by the USGS laboratory are given in TWRI, Book 1, Chapter D2 and Book 5, Chapters A1, A3, and A4, which may be accessed from http://water.usgs.gov/pubs/twri/.

07121500 TIMPAS CREEK AT MOUTH NEAR SWINK, CO

Upper Arkansas Basin
Upper Arkansas-Lake Meredith Subbasin

LOCATION.--Lat 38°00′11″, long 103°39′20″ referenced to North American Datum of 1927, in NW ¼ SW ¼ sec.35, T.23 S., R.56 W., Otero County, CO, Hydrologic Unit 11020005, on right bank at downstream side of 23rd Road bridge, 1.7 mi southwest of Swink, and 2.9 mi upstream from mouth.

DRAINAGE AREA.--496 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--January 1922 to September 1925, March 1968 to current year. Monthly discharge only for some periods, published in WSP 1311.

REVISED RECORDS.--WDR CO 76-1: 1975.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 4,120 ft above NGVD of 1929, from topographic map. Jan. 1922 to Sept. 1925 at several sites downstream at different datum. Mar. 1968 to May 29, 1975, at site 140 ft downstream at datum 0.13 ft lower. May 30, 1975 to Nov. 25, 1980, at site on left bank at same datum.

REMARKS.--Records fair except for those over 200 ft^3/s and estimated daily discharges, which are poor. Natural flow of stream affected by erosion-control and livestock-watering reservoirs, diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas and from Catlin and Rocky Ford Highline Canals.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1922, 21,400 ft^3/s, June 17, 1965, gage height unknown.

07121500 TIMPAS CREEK AT MOUTH NEAR SWINK, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	62	121	26	20	13	12	130	88	131	75	108	68
2	63	116	26	20	13	13	87	79	150	77	105	75
3	58	101	24	18	13	12	69	70	148	77	137	66
4	53	66	23	18	13	11	54	66	127	83	111	67
5	54	71	23	18	13	10	58	61	123	96	87	69
6	60	95	23	19	12	11	66	59	116	237	87	69
7	61	92	22	18	12	12	77	59	133	122	89	68
8	61	88	22	18	13	11	72	66	147	101	89	64
9	55	75	23	17	12	11	66	71	112	93	89	63
10	51	71	21	17	12	11	79	68	87	81	89	60
11	64	67	21	17	13	12	77	69	82	74	82	53
12	90	82	23	17	12	12	77	74	102	73	94	48
13	97	97	23	17	12	17	81	70	125	74	86	48
14	100	104	21	17	13	25	84	63	116	74	81	46
15	96	138	19	17	13	34	82	62	104	73	75	61
16	93	62	20	17	13	180	77	68	93	67	68	71
17	104	36	20	17	12	125	72	80	90	61	60	69
18	116	27	20	17	13	65	75	77	95	61	60	75
19	127	23	20	16	13	64	102	76	90	60	684	77
20	129	22	19	16	12	68	106	74	87	61	94	73
21	134	23	19	15	12	57	76	81	92	66	83	62
22	132	22	20	15	12	53	71	121	95	68	76	75
23	131	23	20	13	12	56	66	119	88	67	76	90
24	151	23	19	14	13	71	69	137	86	64	73	91
25	145	24	19	13	13	83	73	140	e81	67	73	88
26	133	25	19	13	13	83	78	135	e76	80	74	87
27	130	24	19	14	13	162	80	122	70	155	78	87
28	135	27	20	14	13	140	77	120	71	120	82	95
29	144	27	20	14	---	174	83	135	72	127	77	90
30	153	26	19	14	---	186	88	135	72	101	70	86
31	147	---	19	14	---	156	---	133	---	105	62	---
Total	3,129	1,798	652	504	353	1,937	2,352	2,778	3,061	2,740	3,199	2,141
Mean	101	59.9	21.0	16.3	12.6	62.5	78.4	89.6	102	88.4	103	71.4
Max	153	138	26	20	13	186	130	140	150	237	684	95
Min	51	22	19	13	12	10	54	59	70	60	60	46
Ac-ft	6,210	3,570	1,290	1,000	700	3,840	4,670	5,510	6,070	5,430	6,350	4,250

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1922 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	84.4	71.3	31.4	21.4	27.8	56.3	65.0	75.9	81.6	73.3	83.5	69.5
Max	265	210	109	60.4	84.6	201	170	187	318	200	401	159
(WY)	(1924)	(1924)	(1971)	(1923)	(1924)	(1924)	(1924)	(1995)	(1923)	(1923)	(1923)	(1986)
Min	9.21	12.8	5.22	5.34	6.10	15.9	11.0	14.0	21.9	13.0	10.6	9.60
(WY)	(2003)	(2004)	(2004)	(2004)	(2004)	(2004)	(1978)	(1981)	(2002)	(2002)	(2002)	(2002)

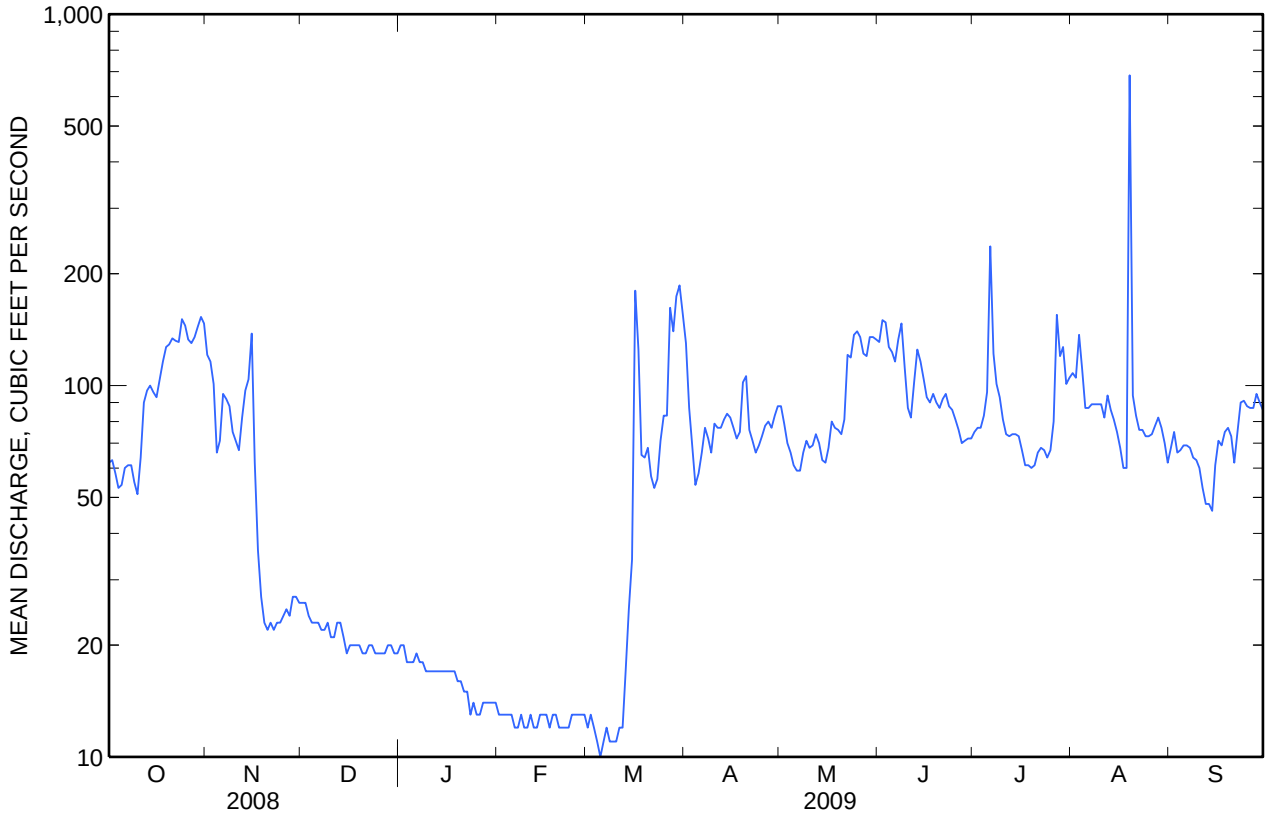
07121500 TIMPAS CREEK AT MOUTH NEAR SWINK, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1922 - 2009	
Annual total	23,093		24,644			
Annual mean	63.1		67.5		62.0	
Highest annual mean					130	1923
Lowest annual mean					23.7	2002
Highest daily mean	274	Aug 16	684	Aug 19	2,670	Aug 17, 1923
Lowest daily mean	16	Jan 1	10	Mar 5	3.3	Aug 7, 1977
Annual seven-day minimum	17	Jan 12	11	Mar 4	4.9	Dec 1, 2003
Maximum peak flow			2,170	Aug 19	[a]12,300	Jul 10, 1978
Maximum peak stage			13.57	Aug 19	[b]21.11	Jul 10, 1978
Annual runoff (ac-ft)	45,800		48,880		44,900	
10 percent exceeds	104		127		119	
50 percent exceeds	64		69		48	
90 percent exceeds	19		13		14	

[a] From contracted-opening measurement of peak flow.

[b] From floodmark.



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Water-Data Report 2009

07124000 ARKANSAS RIVER AT LAS ANIMAS, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°04′51″, long 103°13′09″ referenced to North American Datum of 1927, in SE ¼ NE ¼ sec.3, T.23 S., R.52 W., Bent County, CO, Hydrologic Unit 11020009, on right bank at upstream side of bridge on U.S. Highway 50, 1.1 mi north of courthouse in Las Animas, and 4.2 mi upstream from Purgatoire River.

DRAINAGE AREA.--14,417 mi^2 of which 441 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May to November 1898 (gage heights only), August to November 1909 (gage heights and discharge measurements only), May 1939 to current year. Statistical summary computed for 1975 to current year, subsequent to partial regulation by Pueblo Reservoir.

REVISED RECORDS.--WSP 1341: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Datum of gage is 3,883.97 ft above NGVD of 1929. May 13 to Nov. 12, 1898, and Aug. 1 to Nov. 10, 1909, nonrecording gages near present site at different datums. May 23, 1939 to Apr. 27, 1967, water-stage recorder at site 0.4 mi downstream at datum 9.00 ft lower.

REMARKS.--No estimated daily discharges. Records good. Natural flow of stream affected by storage reservoirs, power developments, transbasin and transmountain diversions, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow partly regulated by Pueblo Reservoir (station 07099350) about 104 mi upstream since Jan. 9, 1974.

07124000 ARKANSAS RIVER AT LAS ANIMAS, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	56	46	171	124	117	172	81	234	628	613	219	62
2	53	53	172	129	109	167	55	335	722	564	179	103
3	49	52	164	129	106	169	41	294	674	541	306	107
4	45	45	150	129	107	174	38	326	817	453	388	85
5	44	48	162	127	109	174	38	319	1,190	489	308	97
6	47	54	152	127	107	168	36	409	1,150	540	299	117
7	60	51	145	126	106	162	34	544	872	577	253	81
8	50	47	146	126	107	168	31	481	718	357	210	66
9	53	46	154	126	123	198	30	489	693	312	228	54
10	55	50	154	125	125	223	29	396	586	421	199	48
11	56	51	147	123	121	234	27	371	464	440	170	53
12	164	48	144	122	114	243	28	382	388	494	141	49
13	186	54	144	122	114	246	30	432	412	491	88	55
14	111	66	144	118	110	245	29	473	495	472	71	62
15	105	142	129	124	108	185	34	542	627	454	89	54
16	96	293	134	122	108	93	33	473	523	451	75	66
17	93	223	145	122	106	66	33	554	593	392	76	68
18	86	200	163	120	102	39	32	853	396	348	74	57
19	79	182	168	119	102	34	32	852	278	299	81	64
20	70	162	163	118	102	33	31	937	334	282	303	102
21	68	161	142	114	101	31	30	799	474	274	181	85
22	63	155	124	114	125	29	30	960	600	295	166	80
23	63	158	153	110	148	27	29	808	591	304	143	95
24	66	161	158	105	155	28	33	638	526	396	124	109
25	66	168	146	101	164	27	34	791	510	317	89	102
26	58	171	148	88	170	26	48	861	492	279	75	119
27	51	171	147	100	171	30	78	807	432	268	88	130
28	51	175	139	97	173	135	76	746	407	162	76	111
29	51	178	135	127	---	220	74	611	530	261	89	98
30	49	173	132	133	---	149	92	604	694	394	107	87
31	46	---	125	121	---	80	---	511	---	272	79	---
Total	2,190	3,584	4,600	3,688	3,410	3,975	1,246	17,832	17,816	12,212	4,974	2,466
Mean	70.6	119	148	119	122	128	41.5	575	594	394	160	82.2
Max	186	293	172	133	173	246	92	960	1,190	613	388	130
Min	44	45	124	88	101	26	27	234	278	162	71	48
Med	58	148	147	122	110	162	33	542	558	394	141	83
Ac-ft	4,340	7,110	9,120	7,320	6,760	7,880	2,470	35,370	35,340	24,220	9,870	4,890

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1975 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	147	141	139	172	177	116	113	531	803	452	294	113
Max	1,092	810	398	641	761	422	877	4,043	4,263	3,339	1,343	373
(WY)	(1985)	(1998)	(1998)	(1998)	(1985)	(1998)	(1987)	(1999)	(1995)	(1995)	(1999)	(1984)
Min	5.13	6.05	8.40	8.45	18.5	9.44	10.8	14.1	16.8	10.0	14.5	9.12
(WY)	(1978)	(1975)	(1978)	(1978)	(1978)	(1975)	(1978)	(1981)	(2002)	(2002)	(2002)	(1977)

07124000 ARKANSAS RIVER AT LAS ANIMAS, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1975 - 2009	
Annual total	99,524		77,993			
Annual mean	272		214		[a]267	
Highest annual mean					841	1995
Lowest annual mean					59.8	2002
Highest daily mean	1,110	Jul 19	1,190	Jun 5	[b]22,600	May 3, 1999
Lowest daily mean	23	Apr 9	26	Mar 26	[c]3.0	Nov 30, 1974
Annual seven-day minimum	26	Apr 7	28	Mar 21	4.1	Sep 26, 1977
Maximum peak flow			1,220	Jun 5	[d]32,900	May 2, 1999
Maximum peak stage			7.98	Jun 5	[f]14.02	May 2, 1999
Annual runoff (ac-ft)	197,400		154,700		193,400	
10 percent exceeds	678		534		541	
50 percent exceeds	149		129		115	
90 percent exceeds	48		46		17	

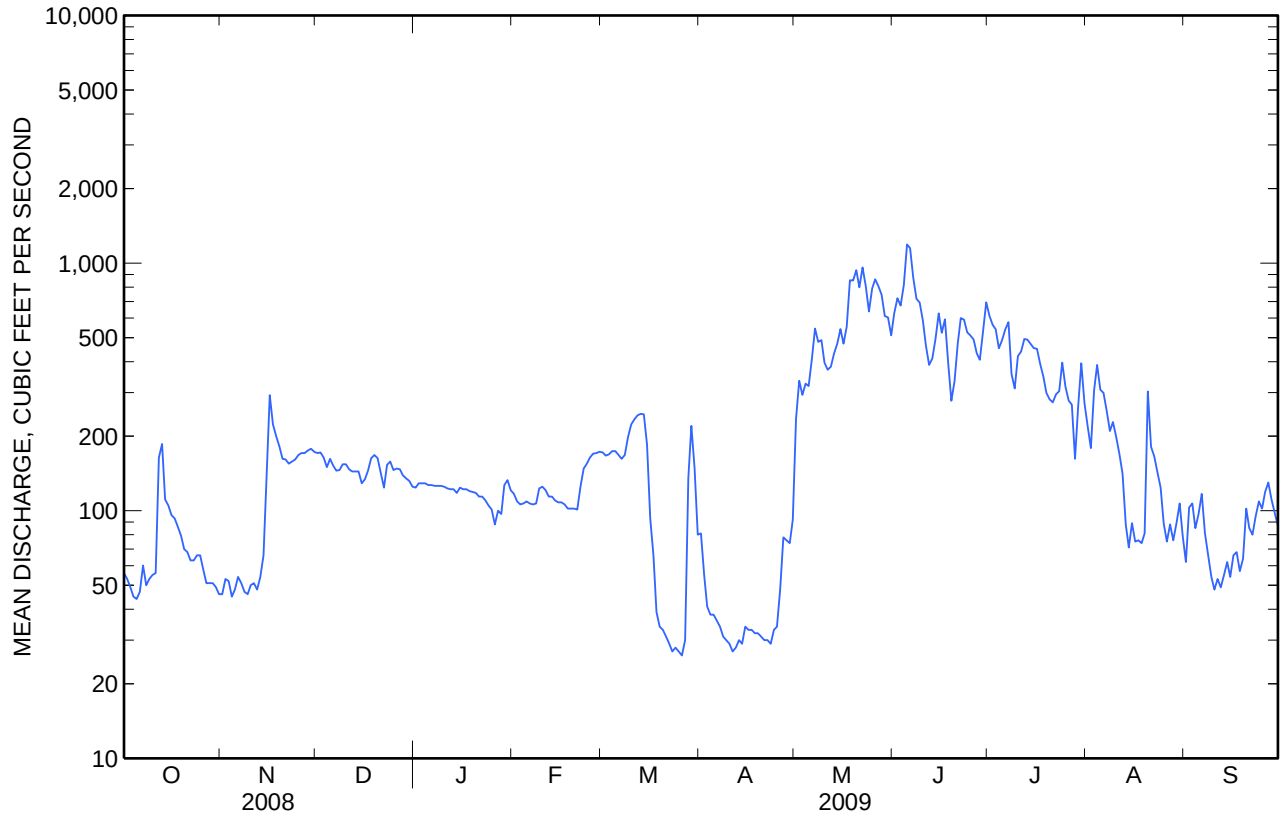
[a] Average discharge for 34 years (water years 1940-73), 203 ft³/s; 147,100 acre-ft/yr, prior to completion of Pueblo Dam.

[b] Maximum daily discharge for period of record, 25,800 ft³/s, May 20, 1955.

[c] Minimum daily discharge for period of record, 0.9 ft³/s, Jul 31, Aug 1 and 3, 1964.

[d] From rating curve extended above 21,600 ft³/s; maximum discharge and stage for period of record, 44,000 ft³/s, May 20, 1955, gage height, 15.03 ft, from current-meter measurement and slope-area measurement of over-flow channel, site and datum then in use.

[f] From floodmark.



07130500 ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°03′59″, long 102°55′55″ referenced to North American Datum of 1927, in NW ¼ NE ¼ sec.8, T.23 S., R.49 W., Bent County, CO, Hydrologic Unit 11020009, on right bank 0.2 mi downstream from John Martin Dam, 2.6 mi upstream from Caddoa Creek, and 3.5 mi southeast of Hasty.

DRAINAGE AREA.--18,915 mi^2 of which 785 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--April 1938 to current year. Published as "at Caddoa" prior to October 1947. Statistical summary computed for 1949 to current year, subsequent to completion of John Martin Reservoir.

REVISED RECORDS.--WSP 1241: 1942 (M). WSP 1341: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry, concrete control, and crest-stage gage. Datum of gage is 3,737.40 ft above NGVD of 1929. Prior to Feb. 22, 1940, at site 3 mi upstream at datum 22.83 ft higher. Feb. 22, 1940 to Feb. 4, 1943, at site 700 ft upstream at datum 3.64 ft higher. Feb. 5, 1943 to Apr. 8, 1975, at site 1.5 mi downstream at datum approximately 27.5 ft lower.

REMARKS.--Records good except for estimated daily discharges and those below 3 ft^3/s, which are poor. Natural flow of stream affected by storage reservoirs, power developments, transbasin and transmountain diversions, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow completely regulated by John Martin Reservoir (station 07130000) 0.2 mi upstream since Oct. 1948.

07130500 ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	95	2.0	0.70	0.80	1.2	1.2	1.8	523	752	1,330	550	150
2	96	1.3	0.74	0.81	1.1	1.2	1.8	522	710	1,370	522	171
3	96	1.2	0.74	0.80	1.1	1.2	1.8	523	635	1,440	488	201
4	96	1.1	0.76	0.74	1.2	1.1	1.8	523	595	1,460	459	182
5	96	1.0	0.83	8.4	1.2	0.96	1.6	520	596	1,570	450	153
6	79	0.91	0.87	1.5	1.1	1.0	1.7	538	586	1,610	453	153
7	52	0.88	0.87	4.8	1.1	1.1	1.7	566	576	1,530	452	153
8	45	0.90	0.84	15	1.1	1.0	1.7	566	578	1,360	452	150
9	56	0.92	0.82	13	e1.1	1.0	1.6	569	592	1,230	470	108
10	75	0.94	0.79	12	1.1	1.4	1.6	569	605	1,200	487	83
11	86	1.0	0.77	1.5	1.0	1.8	1.7	569	603	1,190	440	77
12	216	0.98	0.82	11	1.1	2.5	1.9	537	567	1,200	409	72
13	246	0.79	0.75	17	1.0	2.5	29	505	524	1,220	408	73
14	38	0.64	0.77	16	1.1	2.5	48	507	496	1,240	391	94
15	32	0.70	e0.50	1.3	1.1	2.5	48	518	503	1,260	395	99
16	150	0.75	e0.60	1.2	1.1	2.5	48	538	565	1,280	404	89
17	250	0.73	e0.65	1.1	0.96	2.3	43	539	598	1,280	401	92
18	255	0.78	e0.75	1.2	1.1	2.1	37	525	638	1,260	399	99
19	257	0.81	0.76	1.1	1.1	2.2	33	512	648	1,240	409	99
20	255	0.87	0.70	1.2	1.1	2.2	198	512	519	1,210	418	99
21	194	0.91	e0.65	1.2	1.1	2.2	400	514	480	1,190	417	98
22	153	0.81	e0.65	1.2	1.1	2.1	498	582	481	1,190	428	115
23	152	0.74	e0.70	1.2	1.1	1.9	415	735	459	795	434	142
24	152	0.74	e0.65	1.2	1.1	1.8	462	760	520	572	433	151
25	151	0.80	e0.70	1.2	1.1	1.8	484	761	623	571	431	151
26	150	0.70	0.76	1.1	1.1	1.6	510	762	659	556	278	152
27	173	0.73	0.74	1.1	1.0	2.0	526	749	631	604	88	151
28	188	0.76	0.76	e1.1	1.0	1.7	526	748	647	602	82	167
29	189	0.75	0.78	1.2	---	1.7	526	752	825	511	77	176
30	189	0.73	0.75	1.2	---	1.8	524	752	1,270	507	77	162
31	133	---	0.76	1.2	---	1.7	---	752	---	599	101	---
Total	4,395	26.87	22.93	123.35	30.56	54.56	5,375.7	18,548	18,481	34,177	11,703	3,862
Mean	142	0.90	0.74	3.98	1.09	1.76	179	598	616	1,102	378	129
Max	257	2.0	0.87	17	1.2	2.5	526	762	1,270	1,610	550	201
Min	32	0.64	0.50	0.74	0.96	0.96	1.6	505	459	507	77	72
Ac-ft	8,720	53	45	245	61	108	10,660	36,790	36,660	67,790	23,210	7,660

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1949 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	194	23.3	15.1	17.7	20.8	50.1	404	486	601	709	538	311
Max	565	217	317	725	477	498	1,174	2,576	2,665	2,895	2,127	1,007
(WY)	(1949)	(1966)	(1998)	(1998)	(1966)	(1998)	(1987)	(1987)	(1987)	(1995)	(1965)	(1984)
Min	11.4	0.85	0.64	0.62	0.75	1.06	2.43	34.2	52.0	86.1	22.6	6.69
(WY)	(1975)	(1977)	(1977)	(1977)	(1977)	(1980)	(1973)	(1975)	(1954)	(1963)	(1960)	(1974)

07130500 ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, CO—Continued

SUMMARY STATISTICS

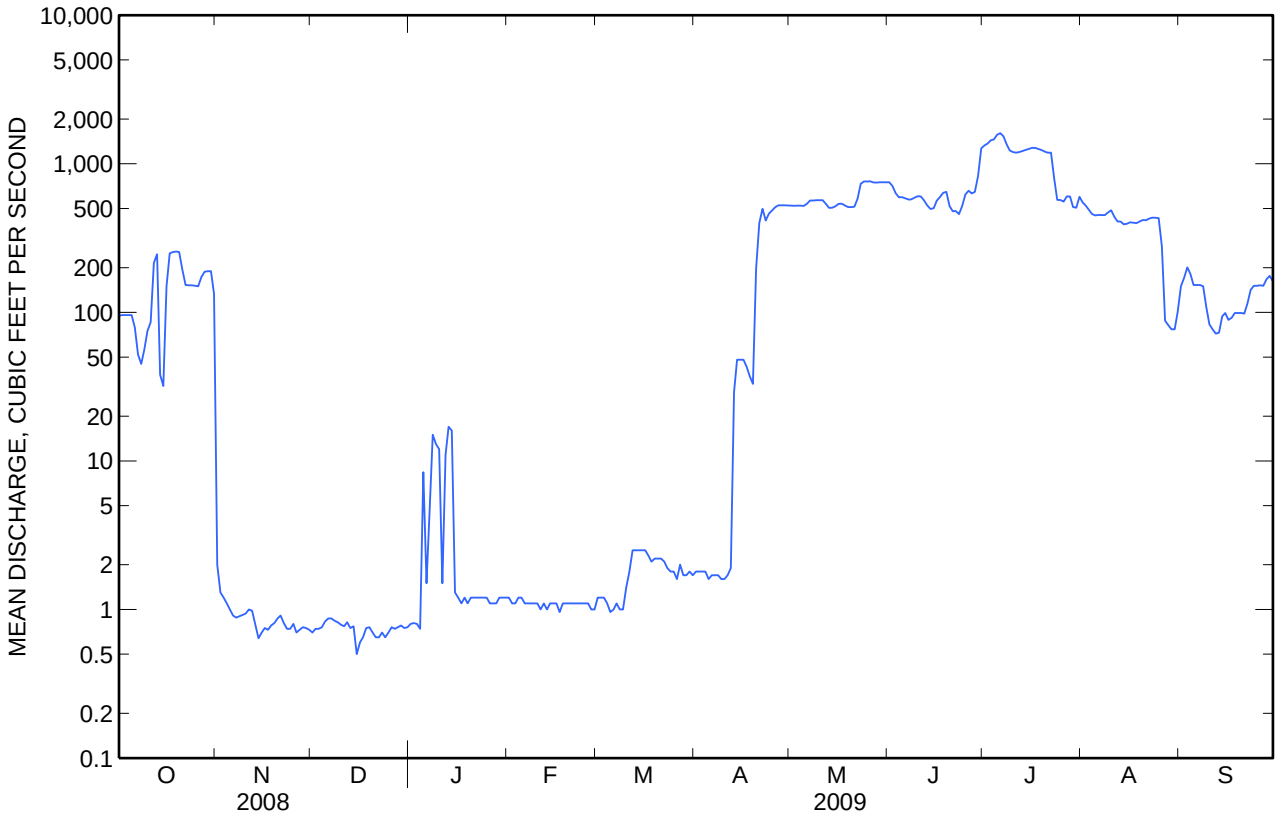
	Calendar Year 2008		Water Year 2009		Water Years 1949 - 2009	
Annual total	108,022.94		96,799.97			
Annual mean	295		265		[a]282	
Highest annual mean					745	1987
Lowest annual mean					82.5	1964
Highest daily mean	1,440	Jul 8	1,610	Jul 6	3,830	Aug 25, 1965
Lowest daily mean	0.50	Dec 15	0.50	Dec 15	[b]0.36	Dec 25, 1979
Annual seven-day minimum	0.64	Mar 11	0.66	Dec 15	0.36	Dec 25, 1979
Maximum peak flow			1,650	Jul 5	[c]4,100	Aug 25, 1965
Maximum peak stage			4.53	Jul 5	[d]5.75	Aug 25, 1965
Annual runoff (ac-ft)	214,300		192,000		204,400	
10 percent exceeds	770		679		853	
50 percent exceeds	152		82		59	
90 percent exceeds	0.76		0.78		1.7	

[a] Average discharge for 5 years (water years 1939-43), 628 ft³/s; 455,000 acre-ft/yr, prior to start of storage in John Martin Reservoir.

[b] Also occurred Dec 26, 1979 to Jan 3, 1980; no flow on many days during 1945-47. Minimum daily discharge prior to start of storage in John Martin Reservoir, 5 ft³/s, Jul 16, 1939.

[c] Maximum discharge for period of record, 40,000 ft³/s, Apr 24, 1942, from rating curve extended above 12,000 ft³/s on basis of flow-over-dam and critical-depth measurement of peak flow, gage height, 10.46 ft, site and datum then in use.

[d] Maximum gage height for period of record, 10.62 ft, Jun 18, 1965 (backwater from Caddoa Creek), site and datum then in use.



Water-Data Report 2009

07133000 ARKANSAS RIVER AT LAMAR, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°06′21″, long 102°37′05″ referenced to North American Datum of 1927, in NE ¼ SE ¼ sec.30, T.22 S., R.46 W., Prowers County, CO, Hydrologic Unit 11020009, on left bank at left downstream end of downstream bridge on U.S. Highways 50 and 287, and 1.3 mi north of courthouse in Lamar.

DRAINAGE AREA.--19,780 mi² of which 950 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May 1913 to September 1955, April 1959 to current year. Monthly discharge only for some periods, published in WSP 1311. Statistical summary computed for 1949 to current year, subsequent to completion of John Martin Reservoir.

REVISED RECORDS.--WSP 1341: 1921 (M), 1945-46 (M), drainage area; WDR CO-86-1: 1985.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Datum of gage is 3,597.39 ft above NGVD of 1929. See WSP 1731 for history of changes prior to Apr. 4, 1959. Apr. 4, 1959 to Mar. 26, 1968, at site 525 ft upstream at datum 2.42 ft higher. Mar. 27, 1968 to Nov. 17, 1982, at site 375 ft downstream at datum 4.00 ft lower. Mar. 18, 1987 to Mar. 6, 2002, at site 75 ft upstream at same datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow of stream affected by storage reservoirs, power developments, transbasin and transmountain diversions, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow regulated by John Martin Reservoir (station 07130000) 21 mi upstream since Oct. 1948.

07133000 ARKANSAS RIVER AT LAMAR, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	16	18	23	21	8.3	8.2	16	10	63	677	45	12
2	16	18	22	22	8.3	8.7	14	11	148	706	33	11
3	16	28	22	21	8.3	9.0	12	12	107	747	26	11
4	16	40	21	21	8.4	8.7	14	12	103	753	19	10
5	16	37	22	21	8.0	8.4	12	11	56	773	15	11
6	17	36	23	22	7.9	12	12	9.0	41	764	19	9.8
7	17	35	22	23	8.0	11	13	10	31	725	19	11
8	16	35	22	22	7.3	10	13	10	23	741	13	11
9	16	35	22	25	8.4	10	12	10	19	655	14	11
10	16	33	22	26	8.1	11	12	13	18	619	15	12
11	17	31	23	26	7.7	10	12	12	27	611	15	12
12	17	30	23	22	7.8	11	13	11	60	607	15	13
13	18	28	23	12	7.8	11	13	11	22	619	14	11
14	19	29	21	9.7	7.9	11	13	12	20	646	14	10
15	18	30	17	8.1	7.9	10	12	11	20	653	14	10
16	18	30	22	8.3	8.2	8.8	13	25	19	652	13	10
17	17	29	25	8.2	7.8	9.3	26	32	18	662	13	11
18	19	28	26	8.0	8.0	9.4	29	33	19	665	13	11
19	17	28	26	8.0	8.0	9.6	24	23	29	664	14	10
20	18	26	25	7.8	8.1	9.8	25	19	19	672	11	9.5
21	19	25	23	8.0	8.3	11	19	19	17	683	10	10
22	22	26	24	8.2	8.4	12	24	21	15	689	11	9.7
23	17	25	26	7.9	8.3	12	12	41	15	578	11	9.1
24	17	24	23	7.9	8.2	11	11	61	15	172	11	8.7
25	16	23	24	8.0	8.1	11	11	73	15	124	11	8.9
26	17	23	23	8.0	8.1	10	12	58	16	111	12	8.5
27	17	23	22	e8.0	8.2	11	10	50	16	973	18	8.2
28	17	23	22	e8.0	8.0	20	10	36	15	251	12	8.0
29	18	23	22	e8.0	---	22	10	35	14	81	13	8.0
30	18	23	22	7.9	---	21	10	35	479	75	13	7.7
31	18	---	21	8.0	---	17	---	34	---	61	13	---
Total	536	842	704	430.0	225.8	354.9	439	760.0	1,479	17,409	489	304.1
Mean	17.3	28.1	22.7	13.9	8.06	11.4	14.6	24.5	49.3	562	15.8	10.1
Max	22	40	26	26	8.4	22	29	73	479	973	45	13
Min	16	18	17	7.8	7.3	8.2	10	9.0	14	61	10	7.7
Ac-ft	1,060	1,670	1,400	853	448	704	871	1,510	2,930	34,530	970	603

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1949 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	35.9	21.1	28.1	37.1	38.1	39.5	152	184	263	318	197	82.2
Max	233	117	350	796	507	516	1,089	2,143	2,087	2,457	1,547	689
(WY)	(1949)	(1998)	(1998)	(1998)	(1966)	(1998)	(1987)	(1987)	(1987)	(1995)	(1965)	(1965)
Min	0.84	1.81	0.56	0.47	0.72	1.11	5.90	6.41	3.80	10.2	10.9	1.37
(WY)	(1978)	(1978)	(1978)	(1978)	(1965)	(1965)	(1995)	(1963)	(1954)	(1964)	(1974)	(1974)

07133000 ARKANSAS RIVER AT LAMAR, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1949 - 2009	
Annual total	26,168.5		23,972.8			
Annual mean	71.5		65.7		[a]116	
Highest annual mean					537	1987
Lowest annual mean					17.7	2003
Highest daily mean	741	Jul 7	973	Jul 27	[b]25,000	Jun 18, 1965
Lowest daily mean	9.3	Mar 20	7.3	Feb 8	[c]0.00	Dec 5, 1953
Annual seven-day minimum	10	Mar 20	7.9	Feb 8	0.21	Jan 10, 1965
Maximum peak flow			2,280	Jul 27	[d]73,800	Jun 18, 1965
Maximum peak stage			11.01	Jul 27	[f]16.48	Jun 18, 1965
Annual runoff (ac-ft)	51,910		47,550		84,190	
10 percent exceeds	101		62		399	
50 percent exceeds	20		16		22	
90 percent exceeds	13		8.2		4.5	

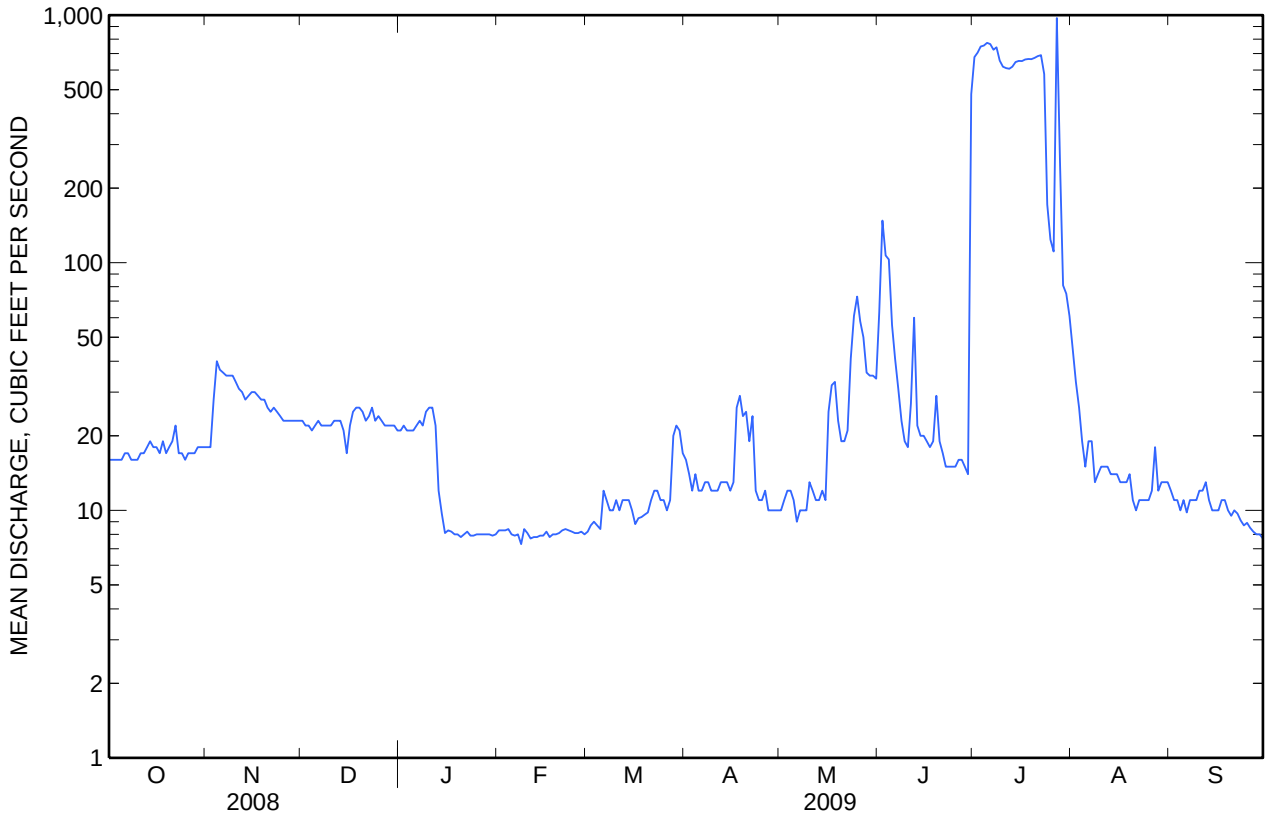
[a] Average discharge for 30 years (water years 1914-43), 298 ft³/s, 215,900 acre-ft/yr, prior to and during construction of John Martin Dam.

[b] Maximum daily discharge for period of record, 87,300 ft³/s, Jun 5, 1921.

[c] Also minimum daily discharge for period of record; also occurred at times in 1913-15.

[d] From current-meter and timed-drift measurement of peak flow, maximum discharge and gage height for period of record, 130,000 ft³/s, (determined by Colorado State Engineer) Jun 5, 1921, from rating curve extended above 10,000 ft³/s, gage height, 14.55 ft, site and datum then in use.

[f] From floodmarks, site and datum then in use.



07134100 BIG SANDY CREEK NEAR LAMAR, CO

Upper Arkansas Basin
Big Sandy Subbasin

LOCATION.--Lat 38°06′51″, long 102°29′00″ referenced to North American Datum of 1927, in SW ¼ SW ¼ sec.21, T.22 S., R.45 W., Prowers County, CO, Hydrologic Unit 11020011, on right bank 35 ft upstream from State Highway 196, 950 ft upstream from mouth, and 7.5 mi east of Lamar.

DRAINAGE AREA.--3,248 mi^2 of which 585 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--February 1968 to September 1982, July 1995 to current year.

REVISED RECORDS.--WDR CO-01-1: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 3,545 ft above NGVD of 1929, from topographic map. Prior to June 30, 1977, at datum 1.00 ft higher.

REMARKS.--Records poor. Natural flow of stream affected by storage, erosion-control, and livestock-watering reservoirs, diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flow affected by backwater from the Arkansas River at times.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 17, 1965, reached a discharge of 3,600 ft^3/s, from slope-area measurement of peak flow 0.5 mi upstream from station. Flood of Aug. 21, 1965, reached a stage of 9.93 ft, from floodmarks, discharge unknown.

07134100 BIG SANDY CREEK NEAR LAMAR, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	e9.5	e8.0	e15	e15	e14	8.8	16	8.9	7.7	13	19	e9.0
2	e10	e8.0	e15	e15	e14	8.9	16	11	11	14	21	e9.5
3	e10	e8.0	e15	e15	e14	7.7	13	11	19	14	20	e10
4	e10	e8.0	e15	e15	e15	6.3	13	12	14	13	13	e10
5	e10	e8.0	e15	e15	e16	6.7	14	12	12	11	16	e10
6	e10	e7.5	e15	e15	e16	7.4	15	11	9.0	12	23	e10
7	e10	e7.5	e15	e15	e15	7.5	15	8.6	8.5	9.5	21	e10
8	e10	e7.5	e15	e15	e18	6.7	14	7.6	7.0	12	19	e10
9	e10	e7.5	e15	e15	e30	6.3	13	8.0	7.0	12	19	e10
10	e10	e7.5	e15	e15	e20	6.0	12	8.7	12	13	13	e9.5
11	e11	e7.0	e15	e15	17	6.1	15	9.7	11	11	6.4	e9.5
12	e10	e7.0	e15	e15	17	6.1	17	10	12	8.3	7.7	22
13	e11	e7.0	e15	e15	16	6.0	23	e9.4	15	6.9	6.5	27
14	e11	e7.0	e15	e15	15	6.1	22	10	20	4.8	8.9	16
15	e12	e7.0	e15	e14	15	6.1	18	11	17	9.3	12	10
16	e9.5	e7.0	e15	e13	15	5.4	16	10	23	8.0	11	10
17	e8.7	e6.5	e15	e10	16	5.3	22	10	15	4.8	9.5	9.2
18	e8.5	e6.5	e15	e11	15	5.4	25	10	11	5.3	7.8	9.0
19	e8.3	e6.5	e15	e12	15	5.4	19	12	8.8	5.5	17	14
20	e8.4	e6.5	e15	e13	15	5.4	19	11	10	6.3	9.8	6.9
21	e8.7	e7.0	e15	e12	15	5.8	17	11	13	7.5	6.0	6.5
22	e9.4	e8.0	e15	e12	15	5.8	16	13	11	7.5	e10	9.2
23	e8.5	e9.0	e16	e12	14	5.6	14	11	12	7.1	e10	e10
24	e8.7	e10	e15	e11	14	5.3	12	11	11	11	e10	e15
25	e9.1	e12	e15	e11	13	5.2	13	14	7.6	6.9	e11	e10
26	e9.4	e13	e15	e10	13	5.2	13	12	8.5	5.0	e15	e10
27	e9.0	e14	e15	e9.0	12	7.2	11	8.6	7.6	16	e12	e11
28	e9.0	e15	e15	e9.0	9.8	7.7	11	10	9.0	21	e11	e11
29	e8.0	e15	e15	e10	---	12	9.8	6.8	9.0	19	e7.0	e11
30	e8.0	e15	e15	e13	---	20	9.1	5.6	10	22	e9.0	e11
31	e8.0	---	e15	e14	---	18	---	9.9	---	20	e9.0	---
Total	293.7	263.5	466	406.0	433.8	227.4	462.9	314.8	348.7	336.7	390.6	336.3
Mean	9.47	8.78	15.0	13.1	15.5	7.34	15.4	10.2	11.6	10.9	12.6	11.2
Max	12	15	16	15	30	20	25	14	23	22	23	27
Min	8.0	6.5	15	9.0	9.8	5.2	9.1	5.6	7.0	4.8	6.0	6.5
Ac-ft	583	523	924	805	860	451	918	624	692	668	775	667

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	8.22	13.7	17.8	18.9	18.8	18.9	18.2	19.0	10.8	9.87	13.6	9.67
Max	28.4	58.9	63.0	75.5	55.6	59.0	70.6	166	42.9	41.6	85.3	41.8
(WY)	(1997)	(1998)	(1998)	(1998)	(1998)	(1998)	(1999)	(1999)	(1999)	(1998)	(1997)	(1976)
Min	0.09	0.41	0.34	0.50	2.23	2.10	0.81	2.14	1.77	0.21	0.03	0.08
(WY)	(1979)	(1978)	(1978)	(1978)	(1978)	(1977)	(1978)	(1975)	(1976)	(1978)	(1976)	(1978)

07134100 BIG SANDY CREEK NEAR LAMAR, CO—Continued

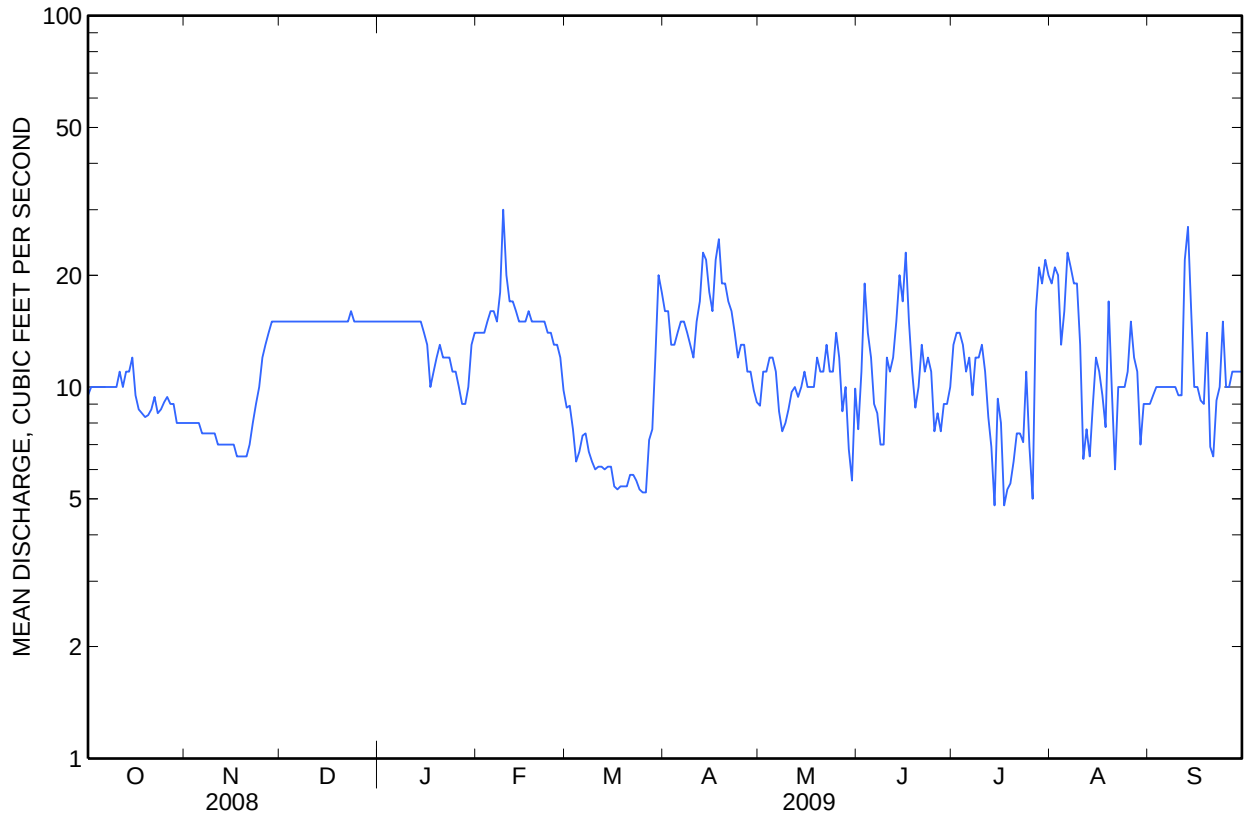
SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1968 - 2009	
Annual total	4,369.3		4,280.4			
Annual mean	11.9		11.7		14.9	
Highest annual mean					45.6	1999
Lowest annual mean					2.23	1979
Highest daily mean	37	Aug 15	30	Feb 9	1,460	May 4, 1999
Lowest daily mean	5.0	Jun 22	4.8	Jul 14	[a]0.00	Aug 13, 1976
Annual seven-day minimum	6.2	Jun 20	5.5	Mar 20	0.00	Sep 1, 1976
Maximum peak flow			38	Jul 28	[b]2,850	May 4, 1999
Maximum peak stage			[c]2.60	Jul 28	9.66	May 4, 1999
Annual runoff (ac-ft)	8,670		8,490		10,820	
10 percent exceeds	16		16		38	
50 percent exceeds	11		11		8.5	
90 percent exceeds	7.5		6.8		1.2	

[a] Also occurred on many days during 1976-79 water years.

[b] From rating curve extended above 1,470 ft³/s on basis of flow through culvert analysis with flow over road measurement at gage height 9.48 ft.

[c] Maximum gage height, 4.44 ft, Nov 17, backwater from beaver dam.



07134990 WILD HORSE CREEK ABOVE HOLLY, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°03′24″, long 102°08′16″ referenced to North American Datum of 1927, in NE ¼ NE ¼ sec.16, T.23 S., R.42 W., Prowers County, CO, Hydrologic Unit 11020009, on left bank 1,000 ft downstream from County Road No. 34, 0.7 mi northwest of Holly, and 0.7 mi upstream from mouth.

DRAINAGE AREA.--270 mi² of which 60 mi² probably is noncontributing, (total area is approximate).

SURFACE-WATER RECORDS

PERIOD OF RECORD.--June 1995 to current year (seasonal records only).

REVISED RECORDS.--WDR CO-01-1: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 3,405 ft above NGVD of 1929, from topographic map. Prior to Apr. 29, 1997, at site 1,050 ft upstream at datum 3.00 ft higher.

REMARKS.--No estimated daily discharges. Records fair except for those below 1.0 ft³/s, which are poor. Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas, the Buffalo Canal, and the Amity Canal.

EXTREMES FOR PERIOD OF RECORD.--(seasonal only) Maximum discharge, 1,270 ft³/s, May 26, 1996, from slope-area measurement of peak flow, gage height, 6.90 ft, from floodmark, site and datum then in use; maximum gage height, 8.63 ft, Aug. 7, 1997, from floodmark; no flow on many days during many years.

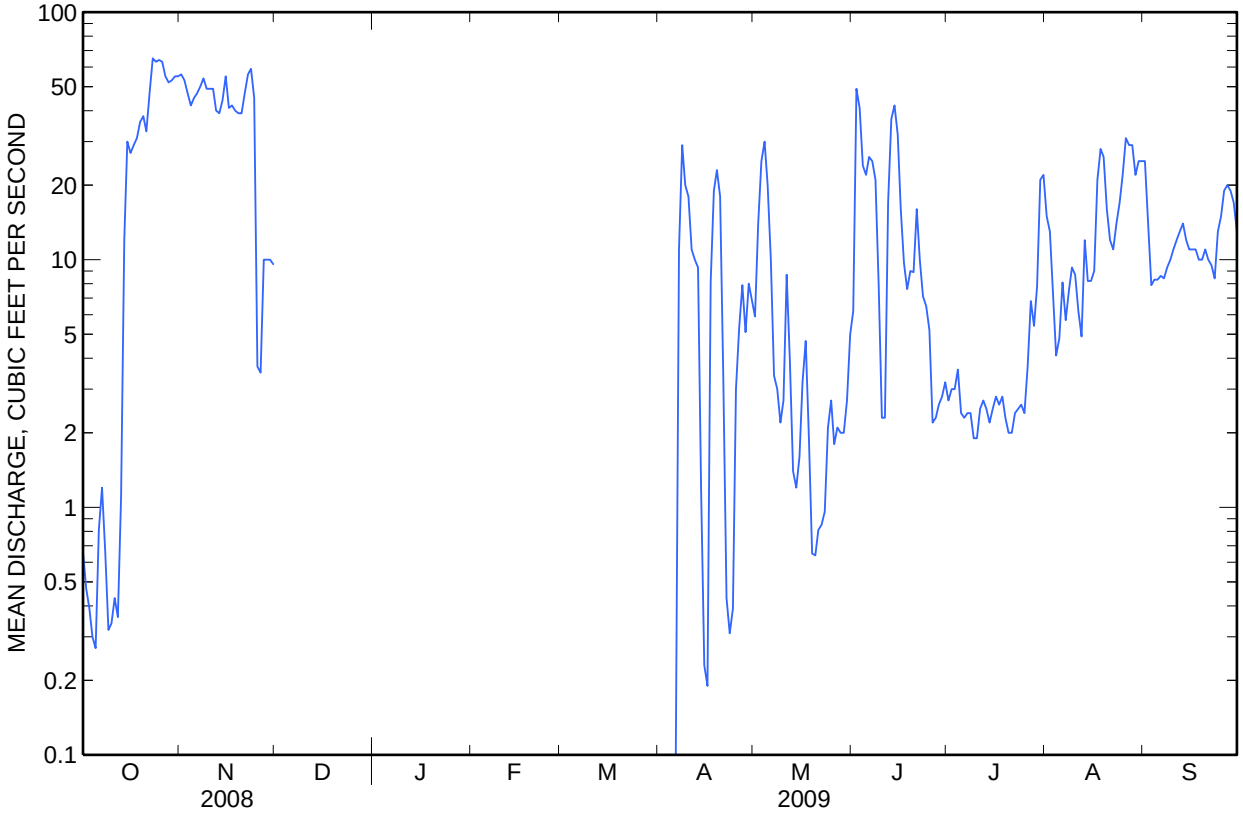
EXTREMES FOR CURRENT YEAR.--(seasonal only) Maximum discharge, 185 ft³/s, June 2, gage height, 5.46 ft; no flow on many days.

07134990 WILD HORSE CREEK ABOVE HOLLY, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.66	56	---	---	---	---	0.00	5.9	6.2	2.7	15	25
2	0.47	53	---	---	---	---	0.00	14	49	3.0	13	14
3	0.39	47	---	---	---	---	0.00	25	41	3.0	7.2	7.9
4	0.30	42	---	---	---	---	0.00	30	24	3.6	4.1	8.3
5	0.27	45	---	---	---	---	0.00	20	22	2.4	4.8	8.3
6	0.81	47	---	---	---	---	0.00	10	26	2.3	8.1	8.6
7	1.2	50	---	---	---	---	11	3.4	25	2.4	5.7	8.4
8	0.66	54	---	---	---	---	29	3.0	21	2.4	7.5	9.3
9	0.32	49	---	---	---	---	20	2.2	7.9	1.9	9.3	10
10	0.34	49	---	---	---	---	18	2.7	2.3	1.9	8.7	11
11	0.43	49	---	---	---	---	11	8.7	2.3	2.5	6.2	12
12	0.36	40	---	---	---	---	10	3.9	17	2.7	4.9	13
13	1.1	39	---	---	---	---	9.3	1.4	37	2.5	12	14
14	12	44	---	---	---	---	1.2	1.2	42	2.2	8.2	12
15	30	55	---	---	---	---	0.23	1.6	32	2.5	8.2	11
16	27	41	---	---	---	---	0.19	3.2	16	2.8	9.0	11
17	29	42	---	---	---	---	8.1	4.7	9.7	2.6	21	11
18	31	40	---	---	---	---	19	1.9	7.6	2.8	28	10
19	36	39	---	---	---	---	23	0.65	9.0	2.3	26	10
20	38	39	---	---	---	---	18	0.64	8.9	2.0	16	11
21	33	47	---	---	---	---	3.3	0.81	16	2.0	12	10
22	47	56	---	---	---	---	0.43	0.85	10	2.4	11	9.5
23	65	59	---	---	---	---	0.31	0.96	7.1	2.5	14	8.4
24	63	45	---	---	---	---	0.39	2.1	6.5	2.6	17	13
25	64	3.7	---	---	---	---	3.0	2.7	5.2	2.4	22	15
26	63	3.5	---	---	---	---	5.3	1.8	2.2	3.7	31	19
27	55	10	---	---	---	---	7.9	2.1	2.3	6.8	29	20
28	52	10	---	---	---	---	5.1	2.0	2.6	5.4	29	19
29	53	10	---	---	---	---	8.0	2.0	2.8	7.8	22	17
30	55	9.6	---	---	---	---	6.9	2.7	3.2	21	25	13
31	55	---	---	---	---	---	---	5.0	---	22	25	---
Total	815.31	1,173.8	---	---	---	---	218.65	167.11	463.8	129.1	459.9	369.7
Mean	26.3	39.1	---	---	---	---	7.29	5.39	15.5	4.16	14.8	12.3
Max	65	59	---	---	---	---	29	30	49	22	31	25
Min	0.27	3.5	---	---	---	---	0.00	0.64	2.2	1.9	4.1	7.9
Ac-ft	1,620	2,330	---	---	---	---	434	331	920	256	912	733

07134990 WILD HORSE CREEK ABOVE HOLLY, CO—Continued



Water-Data Report 2009

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS

Middle Arkansas Basin
Middle Arkansas-Lake McKinney Subbasin

LOCATION.--Lat 38°01′39″, long 102°00′40″ referenced to North American Datum of 1927, in NE ¼ NE ¼ NW ¼ sec.26, T.23 S., R.43 W., Hamilton County, KS, Hydrologic Unit 11030001, on right bank at downstream side of county highway bridge, 1.0 mi south of Coolidge, 1.9 mi downstream from Colorado-Kansas State line, and at mile 1,099.3 .

DRAINAGE AREA.--25,410 mi² of which 1,708 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May to October 1903, March to May 1921, October 1950 to current year. Monthly discharge only for some periods, published in WSP 1311.

REVISED RECORDS.--WSP 1341: 1903, drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,330.84 ft above NGVD of 1929. May 5 to Oct. 31, 1903, nonrecording gage, and Mar. 1 to May 31, 1921, water-stage recorder at present site at different datum. Oct. 1, 1950, to Mar. 31, 1966, water-stage recorder at site 0.3 mi upstream at datum 3.00 ft higher.

REMARKS.--Records fair except those for estimated daily discharges, which are poor. Combined flow of river and Frontier Ditch (station 07137000) represents entire flow that enters Kansas. Flow regulated since 1948 by John Martin Reservoir (station 07130000). Natural flow of stream affected by transmountain diversions, storage reservoirs, power developments, groundwater withdrawals and diversions for irrigation of about 500,000 acres, and return flow from irrigated areas. Satellite telemeter at station.

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	71	159	111	110	99	90	103	64	116	109	330	82
2	70	158	111	111	98	90	101	71	146	252	283	77
3	70	143	110	111	99	89	101	82	235	359	249	78
4	70	125	109	110	99	89	98	94	193	435	213	78
5	70	123	108	109	101	89	98	89	201	477	178	79
6	74	124	111	110	100	90	94	89	180	541	202	76
7	82	126	112	107	98	88	100	86	173	575	176	72
8	79	126	113	104	99	87	99	74	170	614	169	66
9	78	124	113	108	107	87	91	71	150	611	160	68
10	76	126	112	107	108	87	88	74	130	556	147	66
11	76	134	112	110	105	86	85	87	126	531	141	69
12	80	123	111	111	102	84	87	73	142	509	123	75
13	82	123	114	108	102	84	90	67	150	509	207	83
14	90	117	114	107	99	84	80	68	158	508	156	81
15	110	120	106	104	97	86	75	68	148	506	124	78
16	117	116	e100	104	100	85	74	72	139	528	108	79
17	101	116	e107	103	99	84	92	79	143	540	104	77
18	93	112	113	103	97	83	115	77	130	565	104	91
19	98	109	109	105	96	83	114	63	126	565	113	89
20	103	104	109	103	96	83	112	54	127	564	103	95
21	105	105	e107	102	98	82	92	56	143	569	98	95
22	133	113	e106	102	98	82	77	58	126	586	94	96
23	174	114	e113	102	98	84	72	57	97	591	88	94
24	180	114	e111	100	97	84	126	63	84	564	87	93
25	162	99	110	99	98	85	78	79	74	342	85	93
26	152	104	112	97	97	81	73	91	72	274	108	98
27	148	109	113	e95	96	82	76	103	69	242	105	102
28	141	111	112	e95	94	81	71	99	74	551	96	96
29	143	113	112	e95	---	101	68	96	68	526	88	93
30	148	113	112	97	---	107	68	94	66	518	86	87
31	160	---	111	98	---	103	---	103	---	421	86	---
Mean	108	120	110	104	99.2	87.1	89.9	77.5	132	485	142	83.5
Max	180	159	114	111	108	107	126	103	235	614	330	102
Min	70	99	100	95	94	81	68	54	66	109	85	66
Ac-ft	6,620	7,150	6,790	6,400	5,510	5,360	5,350	4,760	7,850	29,830	8,750	4,970

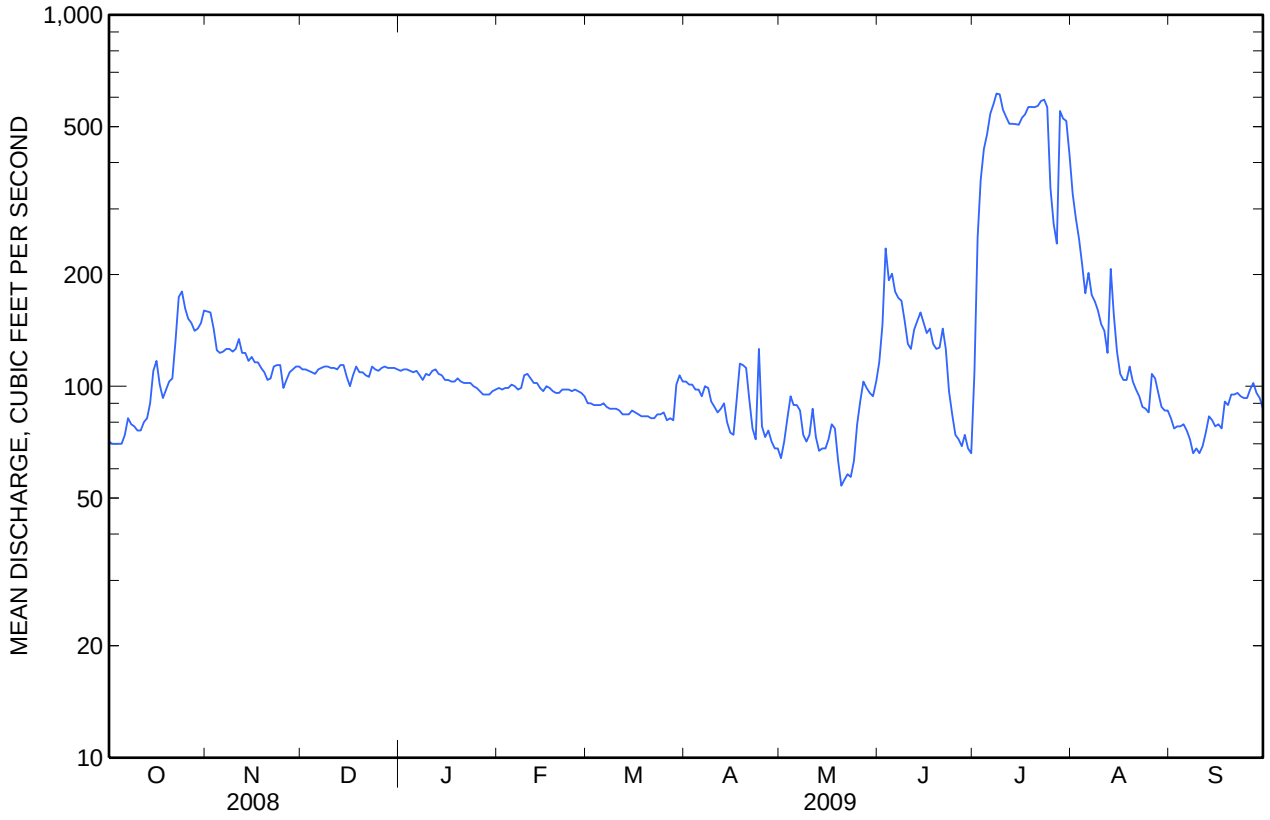
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	128	118	122	129	134	130	205	296	451	361	306	168
Max	332	424	534	972	602	658	1,221	2,478	8,221	2,255	1,979	1,079
(WY)	(1998)	(1998)	(1998)	(1998)	(1966)	(1998)	(1987)	(1999)	(1965)	(1995)	(1965)	(1965)
Min	1.97	1.53	3.94	3.14	5.52	5.63	9.43	6.61	4.20	3.59	1.94	0.90
(WY)	(1979)	(1979)	(1979)	(1979)	(1978)	(1978)	(1979)	(1963)	(1954)	(1974)	(1964)	(1960)

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1951 - 2009	
Annual mean	137		137		213	
Highest annual mean					1,012	1965
Lowest annual mean					19.8	1979
Highest daily mean	656	Jul 13	614	Jul 8	101,000	Jun 18, 1965
Lowest daily mean	44	May 28	54	May 20	0.00	Jul 9, 1954
Annual seven-day minimum	48	May 24	61	May 18	0.00	Jul 9, 1954
Maximum peak flow			825	Jul 28	158,000	Jun 17, 1965
Maximum peak stage			5.37	Jul 28	14.80	Jun 17, 1965
Instantaneous low flow			49	May 21	0.00	many years
Annual runoff (ac-ft)	99,460		99,330		154,100	
10 percent exceeds	183		204		448	
50 percent exceeds	106		102		118	
90 percent exceeds	70		74		12	



07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1964-68, 1970-73, 1975-81, July 1999 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1963 to September 1968, January 1976 to September 1981, October 2000 to current year.
WATER TEMPERATURE: November 1963 to September 1968, October 1976 to September 1981, July 1999 to current year.

INSTRUMENTATION.--Multiparameter water-quality monitor.

REMARKS.--Records good. Interruptions in record are due to ice conditions or malfunction of the recording instrument or sensors.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum, 6,800 miscrosiemens/cm, Mar. 29, 1978; minimum, 184 microsiemens/cm, Aug. 30, 2002.
WATER TEMPERATURE: Maximum, 36.4°C, Aug. 7, 2003; minimum, -0.2°C, Jan. 5, 2005.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 4,860 microsiemens/cm, Dec. 16; minimum, 1,120 microsiemens/cm, July 28.
WATER TEMPERATURE: Maximum, 30.3°C, June 29; minimum, -0.2°C, Dec. 14.

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		October			November			December			January	
1	---	---	---	3,970	3,820	3,920	4,100	4,040	4,070	4,290	4,230	4,260
2	4,090	4,030	4,050	3,820	3,730	3,770	4,080	4,020	4,050	4,240	4,200	4,220
3	4,090	4,020	4,050	---	---	---	4,080	4,040	4,070	4,230	4,180	4,200
4	4,070	4,020	4,050	---	---	---	4,130	4,080	4,100	4,220	4,170	4,190
5	4,110	4,020	4,050	---	---	---	4,160	4,100	4,130	4,220	4,140	4,180
6	4,110	3,950	4,020	4,000	3,970	3,980	4,150	4,090	4,120	4,200	4,150	4,180
7	4,040	3,940	3,970	4,010	3,980	3,990	4,140	4,090	4,110	4,190	4,150	4,170
8	4,060	3,980	4,000	4,000	3,940	3,960	4,120	4,090	4,110	4,190	4,130	4,160
9	4,120	4,040	4,080	3,980	3,950	3,960	4,180	4,110	4,140	4,170	4,130	4,140
10	4,160	4,090	4,120	4,000	3,700	3,920	4,210	4,160	4,190	4,190	4,130	4,150
11	4,160	4,110	4,130	3,940	3,740	3,850	4,230	4,160	4,200	4,170	4,100	4,130
12	4,180	3,950	4,110	4,000	3,940	3,970	4,250	4,190	4,220	4,150	4,110	4,130
13	3,970	3,850	3,930	4,040	4,000	4,020	4,280	4,240	4,260	4,180	4,060	4,140
14	3,930	3,550	3,710	4,100	4,030	4,060	4,440	4,270	4,330	4,140	4,110	4,130
15	3,810	3,550	3,670	4,110	4,040	4,070	4,730	4,440	4,600	4,190	4,140	4,160
16	3,790	3,460	3,600	4,130	4,060	4,090	4,860	4,540	4,700	4,220	4,100	4,160
17	3,940	3,710	3,860	4,100	4,060	4,080	4,570	4,200	4,390	4,170	4,110	4,140
18	3,990	3,930	3,960	4,120	4,080	4,100	4,290	4,200	4,250	4,170	4,110	4,140
19	3,980	3,720	3,880	4,150	4,100	4,120	4,300	4,250	4,280	4,140	4,110	4,120
20	3,740	3,650	3,700	4,190	4,120	4,160	4,360	4,300	4,330	4,140	4,100	4,120
21	3,710	3,560	3,680	4,240	4,160	4,200	4,510	4,360	4,420	4,140	4,080	4,110
22	3,560	3,410	3,510	4,180	4,120	4,150	4,590	4,430	4,520	4,120	4,060	4,090
23	3,430	3,160	3,300	4,160	4,120	4,140	4,490	4,260	4,380	4,100	4,070	4,080
24	3,730	3,310	3,580	4,160	4,110	4,140	4,420	4,290	4,340	4,140	4,080	4,110
25	3,850	3,730	3,800	4,340	4,080	4,160	4,350	4,280	4,320	4,290	4,130	4,190
26	4,050	3,850	---	4,120	4,060	4,090	4,310	4,270	4,300	4,390	4,210	4,330
27	4,150	4,050	4,080	4,100	4,030	4,070	4,360	4,290	4,310	4,370	4,090	4,240
28	4,280	4,150	4,250	4,040	4,010	4,020	4,370	4,270	4,330	4,300	4,060	4,180
29	4,270	4,240	4,250	4,070	4,020	4,050	4,350	4,250	4,310	4,110	4,050	4,080
30	4,290	4,200	4,260	4,080	4,040	4,060	4,310	4,250	4,280	4,160	4,080	4,120
31	4,210	3,970	4,100	---	---	---	4,300	4,240	4,270	4,150	4,070	4,110
Month	---	---	---	---	---	---	4,860	4,020	4,270	4,390	4,050	4,160

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

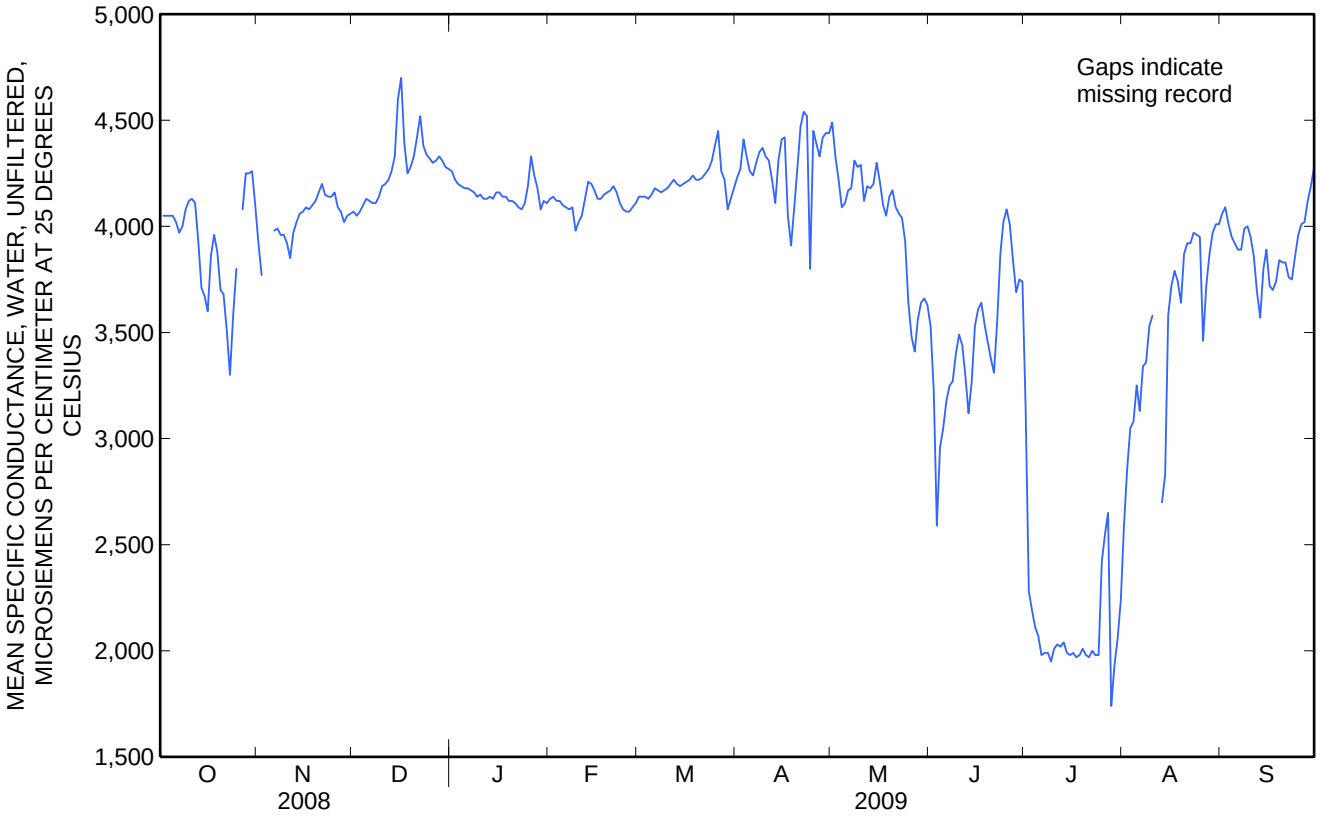
Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		February			March			April			May	
1	4,170	4,100	4,130	4,180	4,110	4,140	4,260	4,180	4,230	4,540	4,400	4,490
2	4,200	4,100	4,140	4,160	4,110	4,140	4,300	4,250	4,270	4,400	4,270	4,330
3	4,170	4,080	4,120	4,170	4,120	4,140	4,490	4,280	4,410	4,310	4,130	4,220
4	4,160	4,090	4,120	4,140	4,110	4,130	4,420	4,250	4,330	4,160	4,030	4,090
5	4,130	4,080	4,100	4,170	4,120	4,150	4,280	4,240	4,260	4,220	4,030	4,110
6	4,110	4,070	4,090	4,190	4,130	4,180	4,260	4,220	4,240	4,270	4,110	4,170
7	4,090	4,060	4,080	4,190	4,150	4,170	4,410	4,240	4,300	4,290	4,120	4,180
8	4,110	4,000	4,090	4,160	4,140	4,160	4,490	4,310	4,350	4,340	4,250	4,310
9	4,010	3,960	3,980	4,190	4,150	4,170	4,420	4,330	4,370	4,340	4,230	4,280
10	4,130	3,920	4,020	4,200	4,170	4,180	4,360	4,320	4,330	4,350	4,160	4,290
11	4,100	3,960	4,050	4,230	4,170	4,200	4,370	4,250	4,310	4,170	4,050	4,120
12	4,180	4,100	4,130	4,260	4,180	4,220	4,360	4,080	4,220	4,250	4,130	4,190
13	4,220	4,180	4,210	4,220	4,180	4,200	4,230	4,070	4,110	4,260	4,130	4,180
14	4,220	4,160	4,200	4,210	4,170	4,190	4,400	4,230	4,310	4,280	4,180	4,200
15	4,220	4,120	4,170	4,220	4,180	4,200	4,460	4,380	4,410	4,350	4,210	4,300
16	4,160	4,090	4,130	4,230	4,200	4,210	4,470	4,310	4,420	4,250	4,100	4,210
17	4,160	4,110	4,130	4,240	4,200	4,220	4,330	3,780	4,050	4,140	4,070	4,100
18	4,170	4,130	4,150	4,270	4,210	4,240	4,070	3,660	3,910	4,080	4,020	4,050
19	4,180	4,140	4,160	4,260	4,200	4,220	4,160	3,970	4,090	4,180	4,080	4,140
20	4,200	4,140	4,170	4,240	4,190	4,220	4,400	4,160	4,280	4,220	4,130	4,170
21	4,220	4,160	4,190	4,260	4,200	4,230	4,510	4,400	4,470	4,140	4,010	4,090
22	4,200	4,120	4,160	4,260	4,230	4,250	4,580	4,480	4,540	4,090	4,020	4,060
23	4,150	4,080	4,110	4,300	4,250	4,270	4,580	4,240	4,520	4,060	4,010	4,040
24	4,100	4,050	4,080	4,340	4,280	4,310	4,300	3,460	3,800	4,010	3,710	3,930
25	4,090	4,040	4,070	4,500	4,320	4,380	4,510	4,300	4,450	3,750	3,500	3,640
26	4,090	4,060	4,070	4,480	4,410	4,450	4,490	4,310	4,390	3,540	3,410	3,480
27	4,110	4,070	4,090	4,450	4,080	4,260	4,420	4,280	4,330	3,450	3,340	3,410
28	4,140	4,080	4,110	4,510	4,050	4,220	4,470	4,380	4,420	3,610	3,450	3,560
29	---	---	---	4,170	3,880	4,080	4,490	4,370	4,440	3,690	3,580	3,640
30	---	---	---	4,160	4,090	4,130	4,510	4,400	4,440	3,690	3,530	3,660
31	---	---	---	4,210	4,140	4,180	---	---	---	3,680	3,570	3,630
Month	4,220	3,920	4,120	4,510	3,880	4,210	4,580	3,460	4,300	4,540	3,340	4,040

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		June			July			August			September	
1	3,620	3,130	3,530	3,670	2,370	3,140	2,740	2,350	2,580	4,090	4,000	4,060
2	3,390	3,020	3,220	2,370	2,230	2,280	3,040	2,680	2,850	4,170	4,000	4,090
3	3,050	2,120	2,590	2,250	2,120	2,190	3,090	2,940	3,050	4,160	3,920	4,010
4	3,090	2,900	2,960	2,130	2,080	2,110	3,220	2,900	3,080	4,020	3,910	3,950
5	3,130	2,970	3,050	2,100	2,020	2,070	3,360	3,060	3,250	3,970	3,860	3,920
6	3,240	3,020	3,180	2,030	1,960	1,980	3,350	2,760	3,130	3,950	3,850	3,890
7	3,290	3,200	3,250	2,010	1,970	1,990	3,480	3,170	3,340	3,990	3,850	3,890
8	3,300	3,250	3,270	2,010	1,970	1,990	3,430	3,250	3,360	4,040	3,920	3,990
9	3,490	3,300	3,400	1,980	1,930	1,950	3,660	3,330	3,530	4,050	3,930	4,000
10	3,510	3,450	3,490	2,040	1,970	2,010	3,680	3,380	3,580	4,000	3,840	3,950
11	3,480	3,360	3,440	2,050	2,000	2,030	---	---	---	3,930	3,780	3,860
12	3,380	3,180	3,290	2,060	1,980	2,020	---	---	---	3,950	3,500	3,690
13	3,360	2,870	3,120	2,070	2,000	2,040	3,680	1,140	2,700	3,740	3,350	3,570
14	3,500	2,960	3,270	2,030	1,930	1,990	3,410	1,880	2,830	4,010	3,560	3,800
15	3,580	3,460	3,530	2,040	1,930	1,980	3,680	3,410	3,580	4,010	3,780	3,890
16	3,880	3,440	3,610	2,050	1,950	1,990	3,800	3,660	3,720	3,780	3,700	3,720
17	3,780	3,600	3,640	2,020	1,930	1,970	3,820	3,750	3,790	3,750	3,660	3,700
18	3,640	3,450	3,540	2,020	1,920	1,980	3,820	3,430	3,740	3,830	3,630	3,740
19	3,540	3,410	3,460	2,030	1,960	2,010	3,820	3,510	3,640	3,910	3,790	3,840
20	3,530	3,060	3,380	2,030	1,910	1,980	3,920	3,810	3,870	3,860	3,780	3,830
21	3,440	3,180	3,310	2,040	1,890	1,970	3,970	3,880	3,920	3,870	3,750	3,830
22	3,730	3,430	3,550	2,040	1,980	2,000	3,980	3,840	3,920	3,790	3,670	3,760
23	4,000	3,730	3,870	2,020	1,920	1,980	4,010	3,920	3,970	3,840	3,630	3,750
24	4,100	3,960	4,020	2,250	1,900	1,980	3,990	3,910	3,960	3,960	3,720	3,860
25	4,150	4,040	4,080	2,510	2,240	2,420	4,000	3,910	3,950	4,000	3,920	3,960
26	4,060	3,920	4,010	2,650	2,400	2,550	3,940	2,950	3,460	4,100	3,950	4,010
27	3,920	3,680	3,840	2,710	2,460	2,650	3,850	3,500	3,720	4,080	3,950	4,020
28	3,770	3,640	3,690	2,560	1,120	1,740	3,910	3,840	3,870	4,170	4,050	4,120
29	3,830	3,670	3,750	2,160	1,480	1,930	4,030	3,890	3,970	4,270	4,140	4,190
30	3,820	3,630	3,740	2,520	1,230	2,060	4,060	3,980	4,010	4,310	4,260	4,280
31	---	---	---	2,480	2,030	2,240	4,060	3,960	4,010	---	---	---
Month	4,150	2,120	3,470	3,670	1,120	2,100	---	---	---	4,310	3,350	3,910

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued



07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		October			November			December			January	
1	21.6	13.0	17.2	15.0	9.6	12.2	6.3	1.7	4.0	5.8	1.4	3.4
2	21.5	13.2	17.0	15.1	10.0	12.6	7.8	3.0	5.4	6.9	1.9	4.2
3	22.1	14.2	17.9	14.7	10.5	12.5	6.5	4.0	5.2	6.3	3.0	4.4
4	21.0	14.3	17.3	15.2	9.7	12.4	4.6	1.7	3.2	3.1	0.8	2.0
5	19.0	15.3	16.9	12.8	9.1	11.2	4.1	0.1	2.0	4.4	-0.1	1.8
6	17.9	14.6	15.8	10.1	6.6	8.3	6.1	1.4	3.5	5.1	0.8	2.7
7	19.2	11.3	15.0	10.7	5.5	8.3	7.8	2.8	5.2	6.0	0.8	3.3
8	19.6	11.4	15.3	12.3	7.4	9.8	9.5	5.6	7.3	8.0	2.3	5.0
9	20.0	12.3	15.8	11.9	7.8	9.8	7.1	2.0	4.2	7.6	3.5	5.5
10	21.0	12.9	16.3	9.2	7.2	8.1	4.4	0.0	2.1	5.5	1.0	3.4
11	16.0	12.3	13.7	10.6	5.8	8.0	6.0	1.3	3.5	5.5	0.5	3.0
12	16.6	13.7	15.9	11.7	6.7	9.0	6.5	2.5	4.5	3.7	0.9	2.4
13	13.9	10.9	12.6	12.6	7.4	9.9	8.8	4.1	6.4	5.7	0.1	2.4
14	12.8	10.9	11.7	10.4	4.1	7.7	6.7	-0.2	2.4	5.8	2.5	3.9
15	15.9	9.5	12.3	7.3	2.3	4.7	-0.1	-0.2	-0.2	3.4	0.7	1.8
16	16.4	10.1	13.0	9.8	3.8	6.6	-0.1	-0.2	-0.2	5.7	-0.2	2.2
17	17.8	11.2	14.2	10.6	5.8	8.0	1.6	-0.2	0.5	7.2	1.8	4.2
18	18.3	11.1	14.4	11.6	5.6	8.4	5.4	0.3	2.4	7.3	2.0	4.6
19	18.6	11.8	14.9	12.3	6.8	9.3	4.7	1.5	3.1	8.6	3.6	5.9
20	15.1	12.7	13.3	8.9	5.2	6.8	3.1	0.1	1.7	8.8	3.1	5.8
21	17.3	12.2	14.3	7.6	2.5	5.0	1.3	-0.2	0.2	8.3	2.5	5.4
22	14.0	8.0	10.5	8.5	3.1	5.6	-0.1	-0.2	-0.1	9.0	2.8	5.7
23	8.0	5.7	6.4	8.6	4.2	6.3	3.1	-0.2	1.1	7.2	3.4	5.7
24	10.3	4.2	6.9	9.0	4.2	6.4	2.6	-0.2	1.0	4.6	0.8	2.5
25	12.8	6.6	9.5	8.4	3.1	5.8	5.7	0.8	3.0	2.0	-0.2	0.4
26	12.9	---	---	7.8	3.2	5.7	8.6	3.7	5.7	-0.1	-0.2	-0.2
27	11.6	6.4	9.0	6.0	3.9	5.1	5.5	1.9	3.8	1.1	-0.2	0.0
28	12.6	6.6	9.5	5.6	4.4	5.0	4.8	-0.1	2.2	3.4	-0.2	1.2
29	14.0	7.9	10.8	6.2	3.4	4.9	6.4	1.4	3.7	6.2	1.0	3.2
30	15.0	9.5	12.1	6.8	3.7	4.7	6.8	2.7	4.5	6.9	-0.1	3.2
31	14.5	9.3	11.9	---	---	---	4.6	1.0	3.0	8.5	1.6	4.8
Month	22.1	---	---	15.2	2.3	7.9	9.5	-0.2	3.0	9.0	-0.2	3.3

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		February			March			April			May	
1	7.2	2.7	4.8	10.7	1.9	6.1	16.1	5.7	10.3	15.9	11.4	13.3
2	7.2	0.4	3.7	12.7	4.1	8.0	16.4	5.8	10.6	12.4	10.2	11.1
3	7.9	1.2	4.5	11.6	5.3	8.4	18.6	7.3	12.3	15.8	10.2	12.3
4	9.3	2.3	5.6	16.1	7.0	11.3	13.6	7.0	11.2	21.1	11.7	15.6
5	9.8	2.6	6.0	16.1	8.8	12.1	11.2	2.1	6.3	22.4	13.9	17.2
6	10.5	3.7	6.8	14.9	7.0	10.9	14.0	3.4	8.2	25.4	15.0	19.6
7	9.9	4.6	7.1	14.5	8.7	11.2	17.2	4.7	10.4	25.5	15.4	20.0
8	8.5	6.0	7.2	15.0	5.6	9.9	18.3	7.7	---	23.9	15.1	19.1
9	10.7	6.2	8.2	13.6	8.0	10.1	12.6	8.7	10.8	22.0	14.2	17.6
10	10.4	4.4	7.3	10.6	4.4	7.1	17.6	6.3	11.2	16.0	12.3	14.1
11	10.3	4.3	7.1	10.0	1.8	5.5	12.2	7.6	9.3	19.5	12.0	14.9
12	8.4	4.5	6.2	9.3	0.4	4.6	8.9	7.7	8.3	26.1	13.7	19.0
13	6.9	4.1	5.2	11.6	4.2	7.1	18.1	7.0	11.8	24.1	15.2	19.2
14	6.5	2.7	4.2	14.2	3.6	8.5	20.6	10.2	15.0	21.3	12.4	16.7
15	7.9	0.3	3.8	16.1	5.4	10.3	18.1	10.4	13.8	21.3	14.1	17.4
16	10.6	2.5	6.2	17.1	6.6	11.6	13.4	10.0	11.8	18.6	13.0	15.2
17	11.1	4.2	7.5	18.5	7.6	12.7	15.5	9.7	11.8	24.1	11.4	17.3
18	9.4	3.9	6.7	17.2	8.9	12.7	13.3	8.6	10.9	26.6	15.4	20.6
19	10.8	3.4	6.8	17.4	9.1	12.7	19.4	9.3	13.7	25.8	15.9	20.4
20	10.9	2.9	6.6	17.1	8.6	12.6	20.7	10.7	15.5	25.4	14.5	---
21	9.2	1.7	5.3	20.4	10.8	15.0	23.0	12.0	17.2	24.1	14.9	18.9
22	10.0	2.3	6.0	16.3	12.2	14.1	25.3	14.0	18.9	24.3	15.5	19.6
23	10.2	3.6	6.9	17.3	10.1	13.0	24.8	13.2	18.7	24.7	15.8	20.0
24	13.9	5.0	9.2	13.2	7.0	9.7	22.6	14.9	18.7	25.4	16.2	20.5
25	14.3	7.1	10.6	13.7	6.6	9.5	18.5	11.3	14.8	24.9	17.9	20.9
26	15.2	7.3	10.7	9.9	4.5	7.6	21.4	11.2	15.1	20.1	15.5	17.5
27	11.1	4.6	7.7	4.5	-0.2	0.6	18.9	9.9	14.1	22.8	13.5	17.7
28	10.2	2.6	6.1	10.8	-0.2	3.9	15.0	10.8	12.9	24.4	15.2	19.7
29	---	---	---	11.3	2.5	6.9	23.6	12.8	17.6	24.6	16.4	20.7
30	---	---	---	9.9	5.9	7.8	18.6	15.0	16.7	26.6	17.2	21.5
31	---	---	---	13.5	2.6	7.6	---	---	---	25.3	18.1	21.6
Month	15.2	0.3	6.6	20.4	-0.2	9.3	25.3	2.1	---	26.6	10.2	---

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		June			July			August			September	
1	24.7	18.5	21.1	28.7	19.0	23.8	25.8	20.0	22.8	25.4	16.3	20.5
2	19.2	16.2	17.6	28.0	21.9	24.7	27.9	20.6	24.0	25.9	17.8	21.7
3	20.6	14.4	17.2	26.1	23.3	25.0	28.9	22.0	25.2	27.6	18.8	22.0
4	24.7	16.4	20.3	27.2	22.9	25.0	28.2	21.0	24.6	21.4	17.0	18.9
5	26.4	19.4	22.7	26.1	23.0	24.7	27.3	21.9	24.4	23.8	17.1	19.5
6	26.7	19.3	22.9	26.3	22.0	24.0	27.9	21.2	24.3	25.5	18.2	21.2
7	24.8	19.5	22.0	27.2	21.9	24.5	28.4	20.9	24.4	26.7	18.3	21.7
8	22.5	15.8	19.1	28.0	22.6	25.3	28.4	20.6	24.3	28.2	17.5	22.2
9	23.5	17.6	20.3	28.7	23.8	26.3	27.9	20.8	24.1	26.2	18.2	21.7
10	20.8	17.8	18.7	29.1	24.3	26.7	27.1	20.7	23.8	25.7	18.4	21.3
11	20.9	16.2	18.1	29.7	25.1	27.3	---	20.9	---	25.5	16.9	20.7
12	24.7	16.3	20.1	29.2	24.4	26.8	28.4	---	---	20.4	17.2	18.7
13	22.3	18.9	20.6	28.6	23.6	26.1	23.1	18.1	20.4	21.4	16.9	18.9
14	21.4	17.9	19.5	28.9	24.3	26.5	25.3	19.5	22.0	23.0	16.4	19.2
15	25.7	17.4	21.3	27.6	23.6	25.6	28.5	19.5	23.5	23.4	15.7	19.2
16	26.7	18.4	22.4	28.0	23.6	25.8	26.5	18.9	22.7	21.9	16.1	19.1
17	26.2	19.5	22.8	26.4	23.3	24.4	24.8	18.4	21.2	22.6	15.9	19.0
18	26.1	18.7	22.1	25.0	21.5	23.1	23.4	18.7	20.6	23.4	15.7	19.0
19	27.6	18.5	22.9	26.6	22.1	24.3	26.4	16.8	21.1	23.8	15.1	19.0
20	24.5	20.5	21.6	26.9	22.8	24.9	26.7	18.3	22.2	24.1	15.3	19.3
21	28.3	18.6	23.0	26.6	23.1	24.9	26.3	17.6	21.7	19.8	13.0	15.9
22	29.4	19.9	24.5	26.4	22.2	24.3	27.3	17.7	22.3	14.8	10.9	12.9
23	28.4	20.7	24.5	26.9	22.2	24.5	28.1	19.0	23.2	15.6	11.1	13.1
24	29.9	19.9	24.6	28.2	22.8	25.4	27.7	18.9	22.8	18.0	11.9	14.6
25	29.3	20.7	25.0	27.9	23.3	25.6	28.1	19.7	23.6	18.2	12.5	15.1
26	29.2	20.9	24.7	27.6	22.8	24.9	27.7	19.8	23.2	21.0	11.6	16.0
27	29.5	20.3	24.4	28.6	22.4	25.2	27.7	19.3	23.2	21.4	13.3	16.9
28	29.0	19.9	24.2	25.2	22.0	23.3	27.1	18.6	22.6	20.0	12.4	15.9
29	30.3	18.7	23.8	23.3	20.8	21.7	26.1	18.1	21.7	20.2	11.1	15.3
30	30.0	19.3	24.2	21.0	19.3	20.0	21.2	17.3	18.9	21.3	13.3	16.9
31	---	---	---	24.8	18.8	21.4	23.7	15.2	19.0	---	---	---
Month	30.3	14.4	21.9	29.7	18.8	24.7	---	---	---	28.2	10.9	18.5

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued